

Approved by USBR December 15, 2010

ORLAND-ARTOIS WATER
DISTRICT

WATER MANAGEMENT PLAN 2008

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Section 1: Description of the District

District Name: Orland-Artois Water District_____

Contact Name: Sue King_____

Title: Manager_____

Telephone: 530-865-4304_____

E-mail: oawdsue@sbcglobal.net_____

Web Address _____

A. History

1. Date district formed: 11-5-54_____ Date of first Reclamation contract: 1963_____
Original size (acres): Unknown_____ Current year (last complete calendar year): 2008_____

2. Current size, population, and irrigated acres

	2008
size (acres)	28,678
population served	208
irrigated acres	28,673

3. Water supplies received in current year

Water Source	AF
Federal urban water (Tbl 1)	
Federal agricultural water (Tbl 1)	21,399
State water (Tbl 1)	
Other Wholesaler (define) (Tbl 1)	
Local surface water (Tbl 1)	
Upslope drain water (Tbl 1)	
District ground water (Tbl 2)	1,307
Banked water (Tbl 1)	
Transferred water (Tbl 6)	7904
Recycled water (Tbl 3)	
Other (define) (Tbl 1)	
Total	30,962

4. Annual entitlement under each right and/or contract

	AF	Source	Contract #	Availability period(s)
Urban AF/Y				
Agriculture AF/Y		CVP	14-06-200-8382A	May 15-Sept.15
Other AF/Y				
Other AF/Y				

5. *Anticipated land-use changes*
None anticipated.

6. *Cropping patterns*

List of current crops (crops with 5% or less of total acreage) can be combined in the „Other” category.

<i>Original Plan (1994)</i>		<i>2003</i>		<i>2008</i>	
<i>Crop Name</i>	<i>Acres</i>	<i>Crop Name</i>	<i>Acres</i>	<i>Crop Name</i>	<i>Acres</i>
Corn	1,523	Almonds	6,115	Almonds	9,045
Rice	2,773	Corn	3,560	Olives	3,172
Alfalfa	2,777	Rice	3,262	Pasture	3,158
Beans	1,813	Alfalfa	2,566	Rice	2,650
Pasture	2,090	Vineyard	1,771	Alfalfa	1,761
misc. (<5%)		misc. (<5%)		misc. (<5%)	8,887
TOTAL	10,976	TOTAL	17,274	TOTAL	28,673

(See Planner, Chapter 2, Appendix A for list of crop names)

7. *Major irrigation methods (by acreage)* **SEE ATTACHMENT A**

<i>Original Plan (1994)</i>		<i>2003</i>		<i>2008</i>	
<i>Irrigation Method</i>	<i>Acres</i>	<i>Irrigation Method</i>	<i>Acres</i>	<i>Irrigation Method</i>	<i>Acres</i>
Flood/Border	10,289	Flood/Border	10,504	Flood/Border	6,666
Furrow	5,636	Flood/Furrow	4427	Flood/Furrow	6037
Sprinkler	4450	Sprinkler	3023	Sprinkler/Pivot	860
Flood/Rice	3262	Flood/Rice	3262	Sprinkler/Solid	2175
Drip/micro sprinkler	1909	Drip/Micro	3909	Drip/Micro	11417
TOTAL	25,546	TOTAL	25,126	TOTAL	27,155

B. Location and Facilities

See Attachment B for points of delivery, turnouts (internal flow), and outflow (spill) points, measurement locations, conveyance system, storage facilities, operational loss recovery system, wells, and water quality monitoring locations

1. *Incoming flow locations and measurement methods*

<i>Location Name</i>	<i>Physical Location</i>	<i>Type of Measurement Device</i>	<i>Accuracy</i>
33.6	County Road M North of Rd 24	Sontaag Meters	6%
35.2	Road 25 East of Highway 99	Sontaag Meters	6%
38.6	East of Road 28	Sontaag Meters	6%
41.2	Road D	Sontaag Meters	6%
44.1	Road 35	Sontaag Meters	6%

2. *Current year Agricultural Conveyance System*

<i>Miles Unlined - Canal</i>	<i>Miles Lined - Canal</i>	<i>Miles Piped</i>	<i>Miles - Other</i>
		115	

~~3. *Current year Urban Distribution*~~

4. *Storage facilities (tanks, reservoirs, regulating reservoirs)*

<i>Name</i>	<i>Type</i>	<i>Capacity (AF)</i>	<i>Distribution or Spill</i>
33.6	40X40 steel tank	376,000 gal	Distribution
38.6	40X40 steel tank	Regulatory Tank, 340,000 gal	All Distribution
	250,000 gal elevated tank	250,000 gal	
41.2	40X50 steel tank	Regulatory Tank, 300,000 gal	Distribution
44.1	Elevated steel tank	100,000 gal	Distribution
TOTAL			

5. *Outflow locations and measurement methods*

Provide this information in Section 2 F.

6. *Description of the agricultural spill recovery system*

None, no spill (fully piped)

7. *Agricultural delivery system operation (check all that apply)*

<i>On-demand</i>	<i>Scheduled</i>	<i>Rotation</i>	<i>Other (describe)</i>
X			

8. *Restrictions on water source(s)*

<i>Source</i>	<i>Restriction</i>	<i>Cause of Restriction</i>	<i>Effect on Operations</i>
CVP	GATES IN 4 MONTHS	Salmon runs	Severely limits our spring and fall water supplies.

9. *Proposed changes or additions to facilities and operations for the next 5 years*

The District owns and operates one groundwater well and is in the process of drilling a second well. This will include a 10,000 gallon holding tank.

C. Topography and Soils

1. *Topography of the district and its impact on water operations and management*

Generally, the District lands are on the Sacramento Valley floor and these are suited to leveling for irrigation. On the westerly edge the lands served are gently sloping and require sprinkler or drip for irrigation.

2. *District soil association map*

See Attachment B, District Soils Map

3. *Agricultural limitations resulting from soil problems* None

<i>Soil Problem</i>	<i>Estimated Acres</i>	<i>Effect on Water Operations and Management</i>
(define)		
(define)		
(define)		
(define)		

D. Climate

1. *General climate of the district service area*

	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>	<i>Annual</i>
Avg Precip.	.52	.39	4.5	.97	.33	.66	0	0	3.8	2	.53	0	13.7
Avg Temp.	44	47	54	64	65	73	77	75	69	61	53	45	61
Max. Temp.	76	74	72	93	94	104	105	100	97	85	79	73	105
Min. Temp.	26	23	33	40	43	51	55	53	47	36	28	22	22
<i>ETo</i>	1.05	1.78	3.35	4.96	6.43	7.52	7.9	6.73	5.28	3.85	1.84	1.36	52.08

Weather station ID 61

Data period: Year 1978 *to Year* 2008

Average wind velocity .447 ms

Average annual frost-free days: 260

2. *Impact of microclimates on water management within the service area*

We do not have micro climates within the District.

N/A

E. Natural and Cultural Resources

1. *Natural resource areas within the service area*

<i>Name</i>	<i>Estimated Acres</i>	<i>Description</i>
NONE		

2. *Description of district management of these resources in the past or present*

NONE

3. *Recreational and/or cultural resources areas within the service area*

<i>Name</i>	<i>Estimated Acres</i>	<i>Description</i>
NONE		

F. Operating Rules and Regulations

1. *Operating rules and regulations*

See Attachment C, District Rules and Regulations (water related)

Water applications, payment and appropriate forms must be submitted before water is to be delivered.

Payment for water must be made within 60 days or water service will be terminated.

2. *Water allocation policy (Agricultural only)*

See Attachment C

Summary – The District does not give priority to certain crops and therefore the water is allocated equally to every acre that is applied for.

3. *Official and actual lead times necessary for water orders and shut-off*

See Attachment C

Summary – The District requires 24 hours notice for turn ons, offs, and any other changes. We do try to remain as flexible as possible due to extenuating circumstances such as the weather.

4. *Policies regarding return flows (surface drainage from farms) and outflow*

None. The District does not have measurable outflows.

5. *Policies on water transfers by the district and its customers*

See Attachment D

Summary – The District allows transfers into and out of the District as outlined in the CVPIA guidelines for transfers.

G. Water Measurement, Pricing, and Billing

1. *Agricultural Customers*

a. *Number of farms* 208

b. *Number of delivery points (turnouts and connections)* 302

c. *Number of delivery points serving more than one farm* 28

d. *Number of measured delivery points (meters and measurement devices)* 302

e. *Percentage of delivered water that was measured at a delivery point* 100%

f. *Delivery point measurement device table*

<i>Measurement Type</i>	<i>Number</i>	<i>Accuracy (+/- %)</i>	<i>Reading Frequency (Days)</i>	<i>Calibration Frequency (Months)</i>	<i>Maintenance Frequency (Months)</i>
<i>Orifices</i>					
<i>Propeller meter</i>	302	3%	weekly	12	36
<i>Weirs</i>					
<i>Flumes</i>					
<i>Venturi</i>					
<i>Metered gates</i>					
<i>Acoustic doppler</i>					
<i>Other (define)</i>					
<i>Total</i>	302				

2. ~~Urban Customers~~

3. Agriculture and Urban Customers

a. Current year agriculture water charges - including rate structures and billing frequency
See Attachment I, for current year rate ordinance

b. Annual charges collected from customers (current year data)

<i>Fixed Charges – determined by acre, etc.</i>			
<i>\$</i>	<i>per acre, etc.</i>	<i>Units billed per year</i>	<i>\$ collected per year</i>
\$24.94	Per acre	28,918	721,214
		TOTAL	721,214

<i>Volumetric charges</i>			
<i>Charges (\$ unit)</i>	<i>Charge units (\$ per AF, etc.)</i>	<i>Units billed during year (AF, etc.)</i>	<i>\$ collected (\$ times units)</i>
\$45	\$45/AF	21,200	954,000
\$105	\$105/AF	6,444	676,620
		TOTAL	\$1,630,620

See Attachment E, District Sample Bills

c. Water-use data accounting procedures

Meters are read weekly using laser scanners and then downloaded into our Easy Reader Program. A spreadsheet is generated showing total usage by meter.

H. Water Shortage Allocation Policies

- 1. Current year water shortage policies or shortage response plan - specifying how reduced water supplies are allocated.*

The District has not adopted a Water Shortage Policy. Recently this has been on our agenda and we currently have 2 versions under discussion. We will have a Policy in place by the end of 2010.

Since we don't have a Policy, we allocate an equal amount of water to every landowner.

None

- 2. Current year policies that address wasteful use of water and enforcement methods*

The Board will adopt a Policy regarding wasteful use of water enforcement methods when they adopt a Water Shortage Allocation Policy.

Section 2: Inventory of Water Resources

A. Surface Water Supply

1. *Acre-foot amounts of surface water delivered to the water purveyor by each of the purveyor's sources*

See Water Inventory Tables, Table 1

2. *Amount of water delivered to the district by each of the district sources for the last 10 years*

See Water Inventory Tables, Table 8

B. Ground Water Supply

1. *Acre-foot amounts of ground water pumped and delivered by the district*

See Water Inventory Tables, Table 2

2. *Ground water basin(s) that underlies the service area*

<i>Name</i>	<i>Size (Square Miles)</i>	<i>Usable Capacity (AF)</i>	<i>Safe Yield (AF/Y)</i>
Sacramento Valley	4,900	22,000,000	13,700

3. *Map of district-operated wells and managed ground water recharge areas*

See Attachment F, District Map of Ground Water Facilities

<i>Name</i>	<i>Date Drilled</i>	<i>Capacity (gpm)</i>	<i>Depth (ft)</i>	<i>Pump Depth (ft)</i>	<i>Spring Static Water Level (ft)</i>	<i>Pumped Water Level (ft)</i>
O-A Well #1	2004	2000	1340	220	90	

4. *Description of conjunctive use of surface and ground water*

See attachment "J"

5. *Ground Water Management Plan*

See Attachment G, Ground Water Management Plan

6. *Ground Water Banking Plan*

See Attachment H, Ground Water Banking Plan

C. Other Water Supplies

1. *"Other" water used as part of the water supply*

See the Water Inventory Tables, Table 1

D. Source Water Quality Monitoring Practices

1. Agricultural water quality concerns: Yes _____ No X

2. Description of the agricultural water quality testing program and the role of each participant, including the district, in the program

None

3. Current water quality monitoring programs for surface water by source

NONE

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>

Current water quality monitoring programs for groundwater by source

NONE

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>

E. Water Uses within the District

1. Agricultural

See Water Inventory Tables, Table 5 - Crop Water Needs

2. Types of irrigation systems used for each crop in current year

<i>Crop name</i>	<i>Total Acres</i>	<i>Level Basin - acres</i>	<i>Furrow - acres</i>	<i>Sprinkler - acres</i>	<i>Low Volume - acres</i>	<i>Multiple methods - acres</i>
Almonds	9,045	0	679	1,753	6,613	
Olives	3,172	41	268	62	2,801	
Pasture	3,158	0	3,158			
Rice	2,650	2,650				
Alfalfa	1,761	1,359		402		
Row Crops	8,887	0	8,887			

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3. ~~Urban use by customer type in current year~~

4. ~~Urban Wastewater Collection/Treatment Systems serving the service area current year~~

5. Ground water recharge/management in current year (Table 6)

NONE

<i>Recharge Area</i>	<i>Method of Recharge</i>	<i>AF</i>	<i>Method of Retrieval</i>
	Total		

6. Transfers and exchanges into or out of the service area in current year (Table 6)

<i>From Whom</i>	<i>To Whom</i>	<i>AF</i>	<i>Use</i>
GCID	OAWD	3,000	AG
Reclamation 108	OAWD	2,848	AG
ACID	OAWD	639	AG
Dunnigan W.D.	OAWD	400	AG
River Garden Farms	OAWD	500	AG
Corning W.D.	OAWD	65	AG
Provident	OAWD	452	AG

7. Trades, wheeling, wet/dry year exchanges, banking or other transactions in current year (Table 6)

NONE

<i>From Whom</i>	<i>To Whom</i>	<i>AF</i>	<i>Use</i>

8. Other uses of water in current year

NONE

<i>Other Uses</i>	<i>AF</i>

F. Outflow from the District

Districts included in the drainage problem area, as identified in “A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990),” should also complete

The District does not measure or track outflow from the District because it is so minimal. We do not conduct water quality tests.

1. Surface and subsurface drain/outflow in current year

<i>Outflow point</i>	<i>Location description</i>	<i>AF</i>	<i>Type of measurement</i>	<i>Accuracy (%)</i>	<i>% of total outflow</i>	<i>Acres drained</i>

<i>Outflow point</i>	<i>Where the outflow goes (drain, river or other location)</i>	<i>Type Reuse (if known)</i>

2. Description of the Outflow (surface and subsurface) water quality testing program and the role of each participant in the program

3. Outflow (surface drainage & spill) Quality Testing Program

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>	<i>Reuse limitation?</i>

Outflow (subsurface drainage) Quality Testing Program

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>	<i>Reuse limitation?</i>

4. Provide a brief discussion of the District’s involvement in Central Valley Regional Water Quality Control Board programs or requirements for remediating or monitoring any contaminants that would significantly degrade water quality in the receiving surface waters.

The southeasterly portion of our District, which is the direction that drain water in the County flows, is mainly orchard with drip systems. Consequently, we do not see water leaving our District.

G. Water Accounting (Inventory)

1. Water Supplies Quantified

- a. Surface water supplies, imported and originating within the service area, by month (Table 1)
- b. Ground water extracted by the district, by month (Table 2)
- c. Effective precipitation by crop (Table 5)
- d. Estimated annual ground water extracted by non-district parties (Table 2)
- e. Recycled urban wastewater, by month (Table 3)
- f. Other supplies, by month (Table 1)

2. Water Used Quantified

- a. Agricultural conveyance losses, including seepage, evaporation, and operational spills in canal systems (Table 4) or
~~Urban leaks, breaks and flushing/fire uses in piped systems (Table 4)~~
- b. Consumptive use by riparian vegetation or environmental use (Table 6)
- c. Applied irrigation water - crop ET, water used for leaching/cultural practices (e.g., frost protection, soil reclamation, etc.) (Table 5)
- d. ~~Urban water use (Table 6)~~
- e. Ground water recharge (Table 6)
- f. Water exchanges and transfers and out-of-district banking (Table 6)
- g. Estimated deep percolation within the service area (Table 6)
- h. Flows to perched water table or saline sink (Table 7)
- i. Outflow water leaving the district (Table 6)
- j. Other

3. Overall Water Inventory

- a. Table 6

H. Assess Quantifiable Objectives:

Identify the Quantifiable Objectives that apply to the District (Planner, chapter 10) and provide a short narrative describing past, present and future plans that address the CALFED Water Use Efficiency Program goals identified for the District.

The District is not named in the Planner, chapter 10 relating to CALFED Water Use Efficiency.

QO #	QO Description	Past, Present & Future Plans
20	Provide flow to improve aquatic ecosystem conditions	All of the water in the Colusa Basin flows to the Sac River, which is a gaining stream in our area. There are certain times during the growing season when our growers use groundwater instead of surface water, leaving

		more water in-stream for multiple uses.
22 & 23	Quality: Reduce group A pesticides to enhance & maintain beneficial uses of water.	The District no longer uses group A pesticides. Some of our growers are now organic, reducing the amount of pesticide applications throughout the District.
24	Reduce salinity to enhance and maintain beneficial uses of water	We do not have salinity problems within our District.
25	Quantity – decrease nonproductive ET to increase water supply for beneficial uses	Our system is completely piped, eliminating nonproductive ET. A majority of our growers have converted to drip systems.
26	Provide long-term diversion flexibility to increase the water supply for beneficial uses.	The District is fully automated with regulating tanks to allow for delivery flexibility. We are also pursuing a program for improved on-farm irrigation systems with assistance from Cal Poly.

Section 3: Best Management Practices (BMPs) for Agricultural Contractors

A. Critical Agricultural BMPs

1. Measure the volume of water delivered by the district to each turnout with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 6%

Number of turnouts that are unmeasured or do not meet the standards listed above: None

Number of measurement devices installed last year: 2

Number of measurement devices installed this year: 1

Number of measurement devices to be installed next year: 2

Types of Measurement Devices Being Installed	Accuracy	Total Installed During Current Year
McCrometer propeller	3%	2

2. Designate a water conservation coordinator to develop and implement the Plan and develop progress reports

Name: Sue King

Title: Manager

Address: P.O. Box 218, Orland, CA 95963

Telephone: 530-865-4304

E-mail: oawdsue@sbcglobal.net

3. Provide or support the availability of water management services to water users
See Attachment J, Notices of District Education Programs and Services Available to Customers.

a. On-Farm Evaluations See Attachment I for brochure sent to landowners with Applications.

- 1) On farm irrigation and drainage system evaluations using a mobile lab type assessment

	Total in district	# surveyed last year	# surveyed in current year	# projected for next year	# projected 2 nd yr in future
Irrigated acres	28,678			1000	1000
Number of farms	208			2-3	2-3

- 2) Timely field and crop-specific water delivery information to the water user

We have updated our computer programs to provide more accurate information with the water user's bill each month. Our new program will show individual irrigation detail to help the growers with their scheduling.

b. Real-time and normal irrigation scheduling and crop ET information

Our new billing system will provide more accurate information for the growers, detail their irrigation schedule and allow them to assess their program more efficiently. We receive weekly soil moisture loss reports from U.C. Davis extension office, which we make available to our growers.

c. Surface, ground, and drainage water quantity and quality data provided to water users

We do not experience any known water quality problems at this time.

d. Agricultural water management educational programs and materials for farmers, staff, and the public

<i>Program</i>	<i>Co-Funders (If Any)</i>	<i>Yearly Targets</i>
Stony Creek Fan Conjunctive Use Program	USBR and DWR	Identify areas where conjunctive use programs can be effectively applied.

See Attachment J for samples of provided materials and notices

e. other

4. Pricing structure - based at least in part on quantity delivered

Describe the quantity-based water pricing structure, the cost per acre-foot, and when it became effective.

The Board sets a base water rate at the beginning of the year based on our water allocation. Any water that is transferred in or used beyond the base rate is at a higher rate. We have structured as many as 4 rates in a single year.

5. Evaluate and describe the need for changes in policies of the institutions to which the district is subject

The District would like more immediate information on our water supply allocation monthly as it changes. We receive very late updates which makes it very difficult for our growers to plan effectively. We would also like to see more flexibility in allowing different types of water (ex. Base supply, Orland Unit Water Users' supply) to be transferred.

6. Evaluate and improve efficiencies of district pumps

Describe the program to evaluate and improve the efficiencies of the contractor's pumps.

The Board is currently looking at long range maintenance programs, but hasn't yet developed a program. We have created a maintenance reserve account for such activities.

B. Exemptible BMPs for Agricultural Contractors

(See Planner, Chapter 2, Appendix C for examples of exemptible conditions)

There aren't any problem soils within the District. The Board will consider alternative land uses if problems should present.

1. Facilitate alternative land use

<i>Drainage Characteristic</i>	<i>Acreage</i>	<i>Potential Alternate Uses</i>
<i>High water table (<5 feet)</i>		
<i>Poor drainage</i>		
<i>Ground water Selenium concentration > 50 ppb</i>		
<i>Poor productivity</i>		

Describe how the contractor encourages customers to participate in these programs.

2. *Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to crops or soils*
The District does not have access to urban wastewater.

<i>Sources of Recycled Urban Waste Water</i>	<i>AF/Y Available</i>	<i>AF/Y Currently Used in District</i>

3. Facilitate the financing of capital improvements for on-farm irrigation systems

The District has not initiated a financing program since 2000. We have a small staff of 4 and have been totally immersed in our groundwater wells and studies. We plan to try and provide some funding to assist our growers in the coming year.

<i>Funding source Programs</i>	<i>How provide assistance</i>
USDA's AWEP Program	Upgrade irrigation systems. The District would oversee projects and disburse funding.
USBR Programs as appropriate	The District would cost-share plus administer projects.

4. Incentive pricing

<i>Structure of incentive pricing</i>	<i>Related goal</i>
Our initial allocation is priced at our base contract rate. Any water that is transferred into the District is priced at a higher rate. Since we're a water short District, water is transferred in every year.	More efficient use of groundwater and surface water

5a) *Line or pipe ditches and canals*

Complete piped system/no seepage.

<i>Canal/Lateral (Reach)</i>	<i>Type of Improvement</i>	<i>Number of Miles in Reach</i>	<i>Estimated Seepage (AF/Y)</i>	<i>Accomplished/Planned Date</i>

b) *Construct regulatory reservoirs*

The District currently has 4 regulating tanks; 33.6,38.6,41.2,44.1. We are in the process of adding a 10,000 gal tank to our second District-owned well.

6. *Increase flexibility in water ordering by, and delivery to, water users*

See Attachment I, contractor ‘agricultural water order’ form

The District requires 24 hours notice for any water turned on or off; however, we remain very flexible to allow for unseen weather conditions that impact crop requirements.

7. *Construct and operate district spill and tailwater recovery systems*

The southeasterly portion of our District, which is the direction that drain water in the County flows, is mainly orchard with drip systems. Consequently, we do not see water leaving our District.

<i>Distribution System Lateral</i>	<i>Annual Spill (AF/Y)</i>	<i>Quantity Recovered and reused (AF/Y)</i>
Total		

<i>Drainage System Lateral</i>	<i>Annual Drainage Outflow (AF/Y)</i>	<i>Quantity Recovered and reused (AF/Y)</i>
Total		

8. Plan to measure outflow.

None. The District is completely piped with little outflow.

Total # of outflow (surface) locations/points _____

Total # of outflow (subsurface) locations/points _____

Total # of measured outflow points _____

Percentage of total outflow (volume) measured during report year _____

Identify locations, prioritize, determine best measurement method/cost, submit funding proposal

<i>Location & Priority</i>	<i>Estimated cost (in \$1,000s)</i>				
	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>

9. Optimize conjunctive use of surface and ground water

This is being explored under our Stony Creek Fan Program, which is attached, ATTACHMENT J.

10. Automate canal structures

Our 5 pumping plants, plus our District-owned well are fully automated.

11. Facilitate or promote water customer pump testing and evaluation

The District provides information on classes available to our growers. Two of our employees attend the classes offered yearly by CSU Chico and most recently a combined class with PG&E.

12. Mapping Chico State University is developing a mapping system at no cost to the District.

GIS maps	Estimated cost (in \$1,000s)				
	2009	2010	2011	2012	2013
Layer 1 – Distribution system					
Layer 2 – Drainage system					
Suggested layers:					
Layer 3 – Ground water information					
Layer 4 – Soils map					
Layer 5 – Natural & cultural resources					
Layer 6 – Problem areas					

C. Provide a 3-Year Budget for Implementing BMPs

1. Amount actually spent during current year.

BMP #	BMP Name	Actual Expenditure (not including staff time)	Staff Hours
A 1	Measurement	\$1,100	50
2	Conservation staff	\$0	950
3	On-farm evaluation /water delivery info	\$0	0
	Irrigation Scheduling	\$0	80
	Water quality	\$0	0
	Agricultural Education Program	\$0	0
4	Quantity pricing	\$0	20
5	Policy changes	\$800	30
6	Contractor"s pumps	\$0	0
B 1	Alternative land use	\$0	0
2	Urban recycled water use	\$0	0
3	Financing of on-farm improvements	\$0	0
4	Incentive pricing	\$0	40
5	Line or pipe canals/install reservoirs	\$0	0
6	Increase delivery flexibility	\$0	20
7	District spill/tailwater recovery systems	\$0	0
8	Measure outflow	\$0	0
9	Optimize conjunctive use	\$0	500
10	Automate canal structures	\$0	0
11	Customer pump testing	\$0	0
12	Mapping	\$0	50
	Total	\$1,900	1,740

2. Projected budget summary for the next year.

<i>BMP #</i>	<i>BMP Name</i>	<i>Budgeted Expenditure (not including staff time)</i>	<i>Staff Hours</i>
<i>A</i>	<i>1 Measurement</i>	<i>\$1,500</i>	<i>50</i>
	<i>2 Conservation staff</i>	<i>\$0</i>	<i>1,000</i>
	<i>3 On-farm evaluations/water delivery info</i>	<i>\$0</i>	<i>0</i>
	<i>Irrigation Scheduling</i>	<i>\$0</i>	<i>0</i>
	<i>Water quality</i>	<i>\$0</i>	<i>0</i>
	<i>Agricultural Education Program</i>	<i>\$0</i>	<i>0</i>
	<i>4 Quantity pricing</i>	<i>\$0</i>	<i>0</i>
	<i>5 Policy changes</i>	<i>\$500</i>	<i>25</i>
	<i>6 Contractor"s pumps</i>	<i>\$0</i>	<i>0</i>
<i>B</i>	<i>1 Alternative land use</i>	<i>\$0</i>	<i>0</i>
	<i>2 Urban recycled water use</i>	<i>\$0</i>	<i>0</i>
	<i>3 Financing of on-farm improvements</i>	<i>\$15,000</i>	<i>80</i>
	<i>4 Incentive pricing</i>	<i>\$0</i>	<i>20</i>
	<i>5 Line or pipe canals/install reservoirs</i>	<i>\$0</i>	<i>0</i>
	<i>6 Increase delivery flexibility</i>	<i>\$0</i>	<i>20</i>
	<i>7 District spill/tailwater recovery systems</i>	<i>\$0</i>	<i>0</i>
	<i>8 Measure outflow</i>	<i>\$0</i>	<i>0</i>
	<i>9 Optimize conjunctive use</i>	<i>\$0</i>	<i>500</i>
	<i>10 Automate canal structures</i>	<i>\$0</i>	<i>0</i>
	<i>11 Customer pump testing</i>	<i>\$0</i>	<i>0</i>
	<i>12 Mapping</i>	<i>\$0</i>	<i>50</i>
	<i>Total</i>	<i>\$17,000</i>	<i>1,745</i>

3. Projected budget summary for 3rd year.

<i>BMP #</i>	<i>BMP Name</i>	<i>Budgeted Expenditure (not including staff time)</i>	<i>Staff Hours</i>
<i>A</i>	<i>1 Measurement</i>	<i>\$4,000</i>	<i>100</i>
	<i>2 Conservation staff</i>	<i>\$900</i>	<i>50</i>
	<i>3 On-farm evaluations/water delivery info</i>	<i>\$900</i>	<i>50</i>
	<i>Irrigation Scheduling</i>	<i>\$750</i>	<i>40</i>
	<i>Water quality</i>	<i>\$0</i>	<i>0</i>
	<i>Agricultural Education Program</i>	<i>\$450</i>	<i>30</i>
	<i>4 Quantity pricing</i>	<i>\$200</i>	<i>10</i>
	<i>5 Policy changes</i>	<i>\$500</i>	<i>30</i>
	<i>6 Contractor"s pumps</i>	<i>\$400</i>	<i>20</i>

(continued)

<i>BMP #</i>		<i>BMP Name</i>	<i>Budgeted Expenditure (not including staff time)</i>	<i>Staff Hours</i>
<i>B</i>	<i>1</i>	<i>Alternative land use</i>	\$0	0
	<i>2</i>	<i>Urban recycled water use</i>	\$0	0
	<i>3</i>	<i>Financing of on-farm improvements</i>	\$15,000	40
	<i>4</i>	<i>Incentive pricing</i>	\$400	20
	<i>5</i>	<i>Line or pipe canals/install reservoirs</i>	\$0	0
	<i>6</i>	<i>Increase delivery flexibility</i>	\$0	0
	<i>7</i>	<i>District spill/tailwater recovery systems</i>	\$0	0
	<i>8</i>	<i>Measure outflow</i>	\$0	0
	<i>9</i>	<i>Optimize conjunctive use</i>	\$3500	200
	<i>10</i>	<i>Automate canal structures</i>	\$0	0
	<i>11</i>	<i>Customer pump testing</i>	\$0	0
	<i>12</i>	<i>Mapping</i>	\$800	40
<i>Total</i>			\$27,300	630

Year of Data Enter data year here

Table 1

Surface Water Supply

2008 Month Month	Federal Ag Water (acre-feet)	Federal non- (define) (acre-feet)	State Water Contract (acre-feet)	Local Water Supply (acre-feet)	Other Water Transferred (acre-feet)	Upslope Spill / Drain (acre-feet)	Total (acre-feet)
Method							
January	295	0	0	0	0	0	295
February	435	0	0	0	0	0	435
March	433	0	0	0	0	0	433
April	2666	0	0	0	300	0	2,966
May	5473	0	0	0	300	0	5,773
June	5341	0	0	0	300	0	5,641
July	5881	0	0	0	300	0	6,181
August	4779	0	0	0	300	0	5,079
September	2539	0	0	0	159	0	2,698
October	1117	0	0	0	0	0	1,117
November	79	0	0	0	0	0	79
December	265	0	0	0	0	0	265
TOTAL	29,303	0	0	0	1,659	0	30,962

Table 2**Ground Water Supply**

2008 Month	District Groundwater (acre-feet)	Private Groundwater *(acre-feet)
Method		
January	0	1,000
February	0	1,500
March	0	6,500
April	300	11,000
May	300	15,000
June	300	15,000
July	300	16,000
August	300	10,000
September	159	5,000
October	0	3,000
November	0	1,000
December	0	0
TOTAL	1,659	85,000

*normally estimated

Table 3**Total Water Supply**

2008 Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Recycled M&I (acre-feet)	Total District Water (acre-feet)
Method				
January	295	0	0	295
February	435	0	0	435
March	433	0	0	433
April	2,666	200	0	2,866
May	5,473	200	0	5,673
June	5,341	300	0	5,641
July	5,881	300	0	6,181
August	4,779	200	0	4,979
September	2,539	107	0	2,646
October	1,117	0	0	1,117
November	79	0	0	79
December	265	0	0	265
TOTAL	29,303	1,307	0	30,610

*Recycled M&I Wastewater is treated urban wastewater that is used for agriculture.

Table 4

Distribution System

2008

Canal, Pipeline, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation (acre-feet)	Evaporation (acre-feet)	Spillage (acre-feet)	Seepage (acre-feet)	Total (acre-feet)
Pipeline	607,200	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL			0	0	0	0	0	0

Table 5

Crop Water Needs

2008 Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requirement (AF/Ac)	Cultural Practices (AF/Ac)	Effective Precipitation (AF/Ac)	Appl. Crop Water Use (acre-feet)
Almonds	9,045	2.20	0.11	0.70	1.18	16,552
Olives	3,172	3.20	0.16	0.00	0.00	10,658
Pasture	3,158	6.00	0.30	0.00	0.00	19,895
Rice	2,650	3.00	0.15	0.00	0.00	8,348
Alfalfa	1,761	3.50	0.18	0.00	0.00	6,480
Row Crops	8,887	2.50	0.13	0.00	0.00	23,373
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
Crop Acres	28,673					85,306

Total Irrig. Acres 28,673 (If this number is larger than your known total, it may be due to double cropping)

Table 6**2008 District Water Inventory**

Water Supply	Table 3		23,058
Riparian ET	(Distribution and Drain)	minus	0
Groundwater recharge	(intentional - ponds, injection)	minus	0
Seepage	Table 4	minus	0
Evaporation - Precipitation	Table 4	minus	0
Spillage	Table 4	minus	0
Transfers/exchanges/trades/wheeling	(into or out of the district)	plus/minus	7,904
Non-Agri deliveries	(delivered to non-ag customers)	minus	0
Water Available for sale to agricultural customers			30,962
<i>Compare the above line with the next line to help find data gaps</i>			
2008 Actual Agricultural Water Sales	From District Sales Records		30,610
Private Groundwater	Table 2	plus	86,659
Crop Water Needs	Table 5	minus	85,306
Drainwater outflow	(tail and tile not recycled)	minus	0
Percolation from Agricultural Land	(calculated)		(306)

Table 7

Influence on Groundwater and Saline Sink

2008

Agric Land Deep Perc + Seepage + Recharge - Groundwater Pumping = District Influence on	0
Estimated actual change in ground water storage, including natural recharge)	0
Irrigated Acres (from Table 5)	28,673
Irrigated acres over a perched water table	0
Irrigated acres draining to a saline sink	0
Portion of percolation from agri seeping to a perched water table	0
Portion of percolation from agri seeping to a saline sink	0
Portion of On-Farm Drain water flowing to a perched water table/saline sink	0
Portion of Dist. Sys. seep/leaks/spills to perched water table/saline sink	0
Total (AF) flowing to a perched water table and saline sink	0

Table 8

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Ag Water (acre-feet)	Federal non- Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	Other Water Transferred (acre-feet)	Upslope Drain Water (acre-feet)	Total (acre-feet)
1999	57,932	0	0	0		0	57,932
2000	56,668	0	0	0		0	56,668
2001	42,084	0	0	0	0	0	42,084
2002	64,436	0	0	0	0	0	64,436
2003	53,266	0	0	0	0	0	53,266
2004	61,413	0	0	0	0	0	61,413
2005	48,299	0	0	0	0	0	48,299
2006	49,949	0	0	0	0	0	49,949
2007	49,104	0	0	0	0	0	49,104
2008	29,303	0	0	0	1,659	0	30,962
Total	512,454	0	0	0	1,659	0	514,113
Average	51,245	0	0	0	165	0	51,411

“ATTACHMENT A”

DISTRICT FACILITIES MAP

SERVICE AREA MAP

MAJOR IRRIGATION METHODS

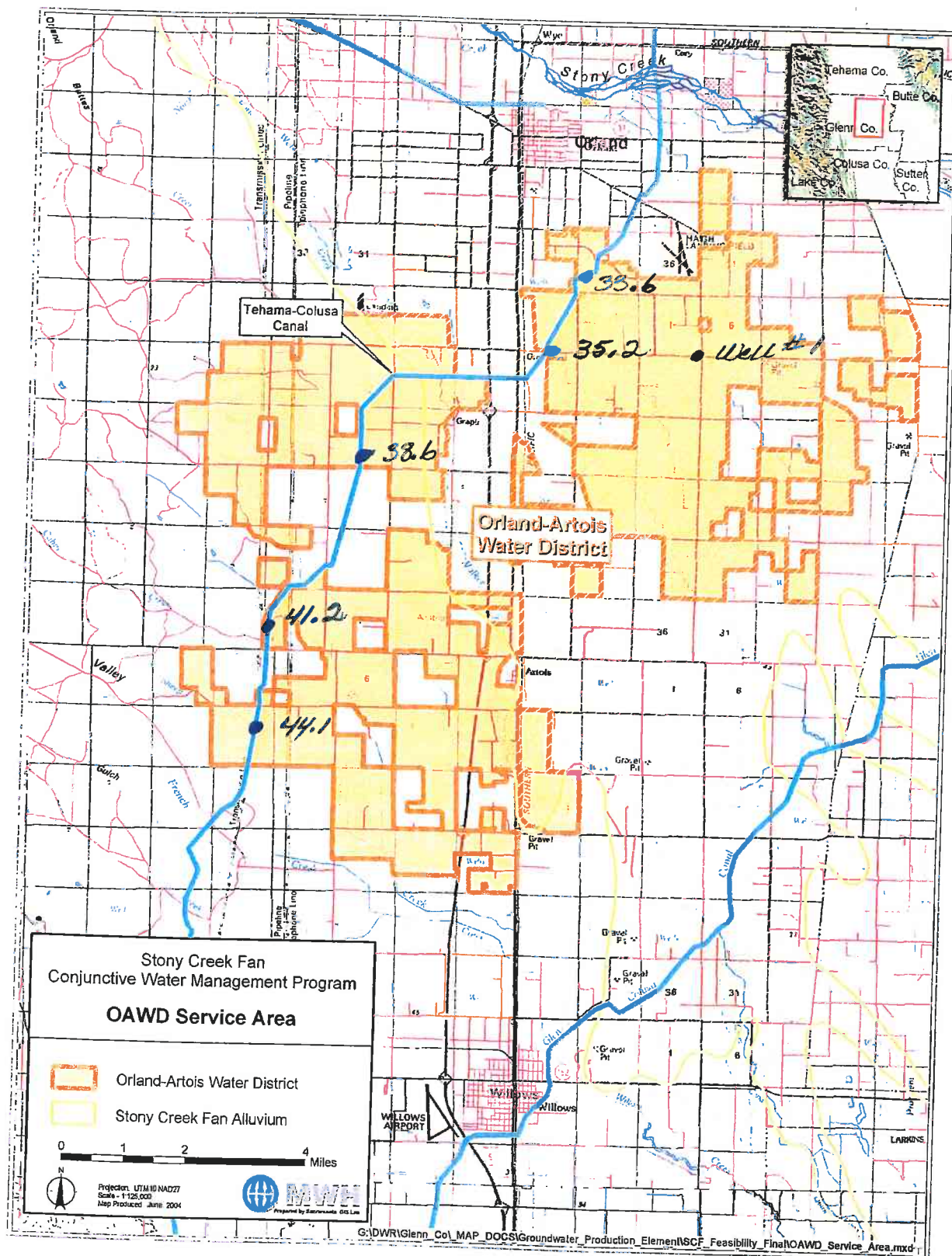


Figure 15. OAWD Service Area

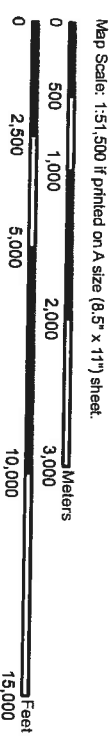
ATTACHMENT “B”

SOILS MAP

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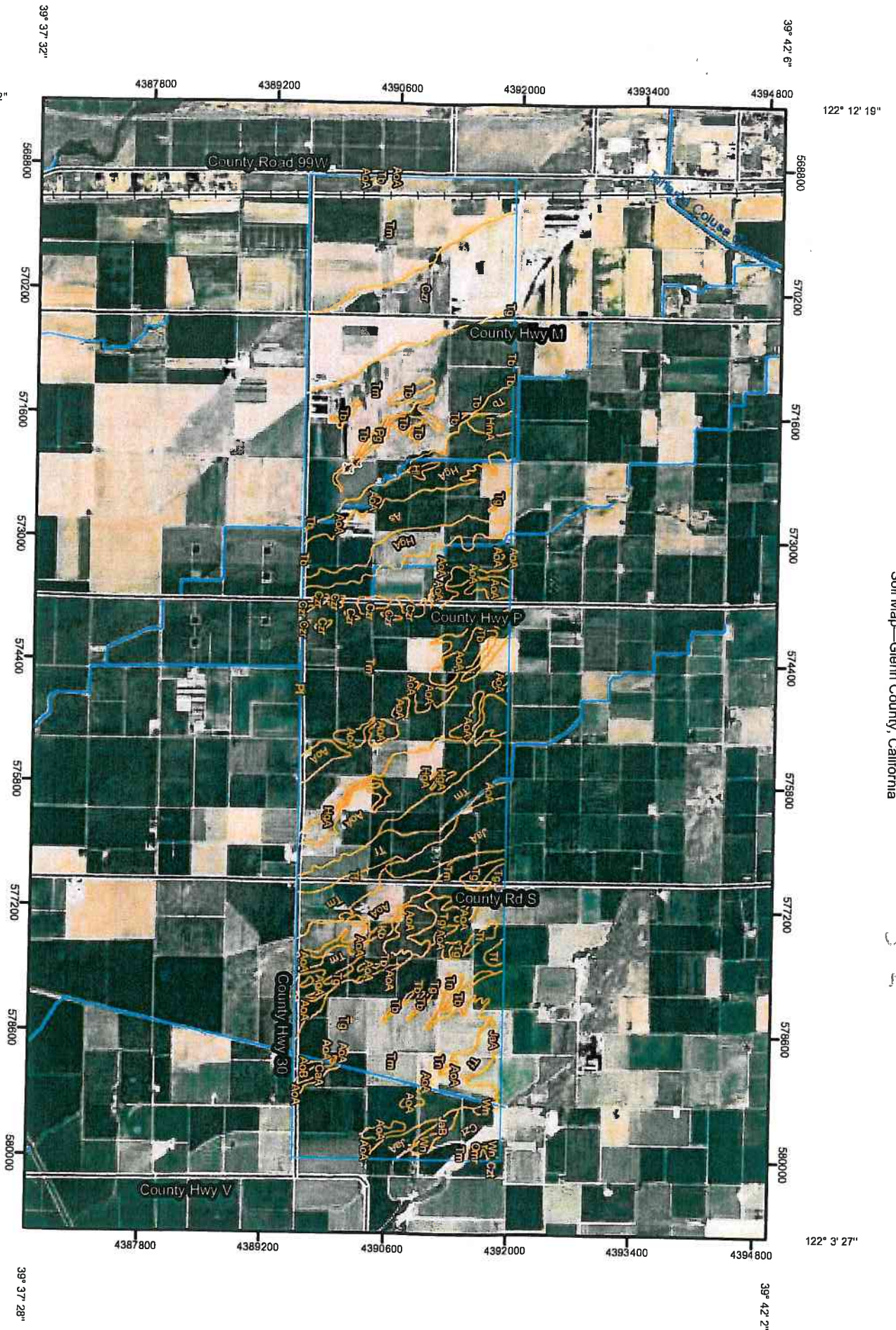


2



Soil Map—Glenn County, California

33



122° 12' 22"



Map Scale: 1:60,500 If printed on A size (8.5" x 11") sheet.
0 500 1,000 2,000 3,000 Meters
0 3,000 6,000 12,000 18,000 Feet



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

4 E

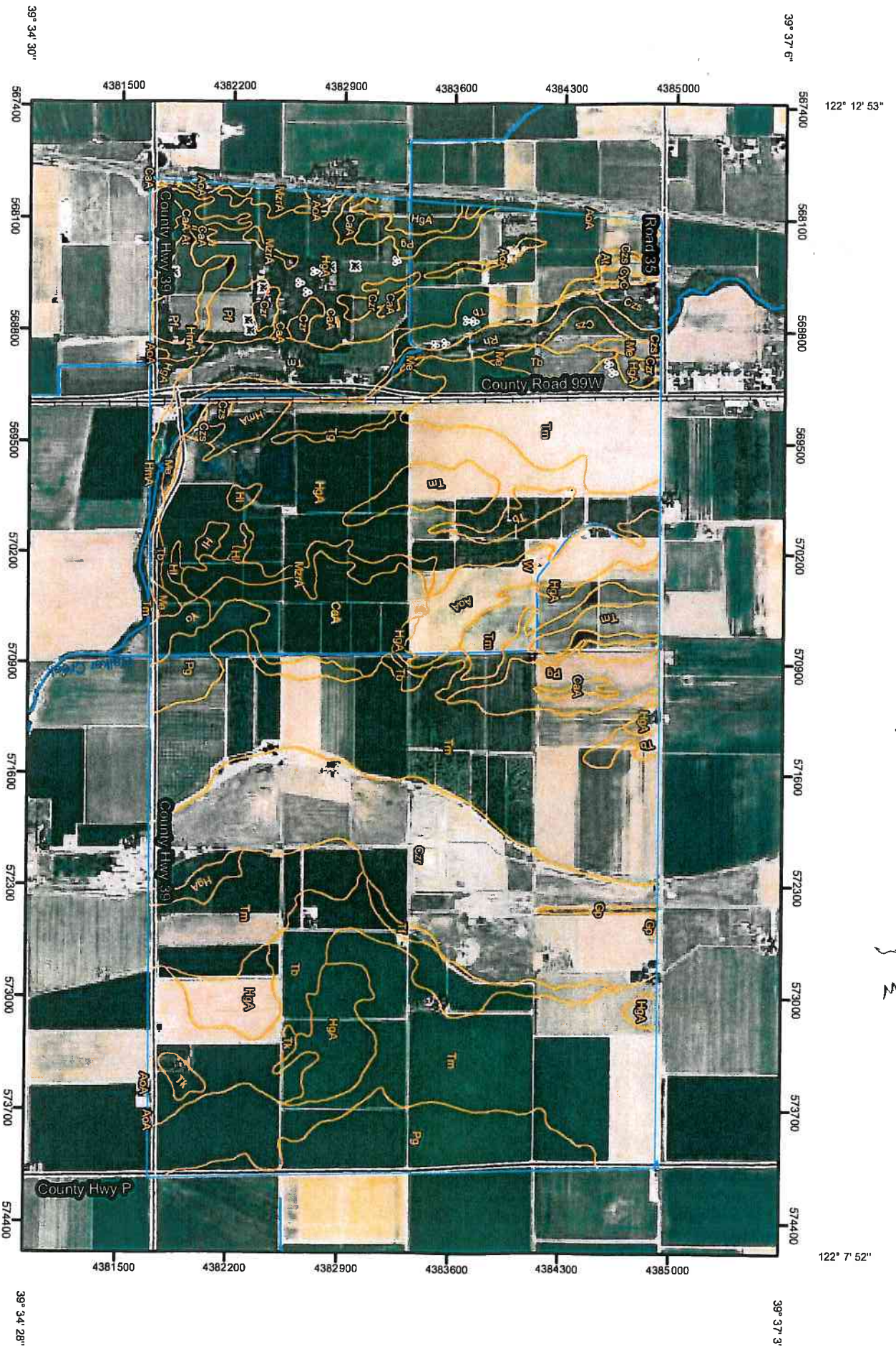


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Soil Map—Glenn County, California

52

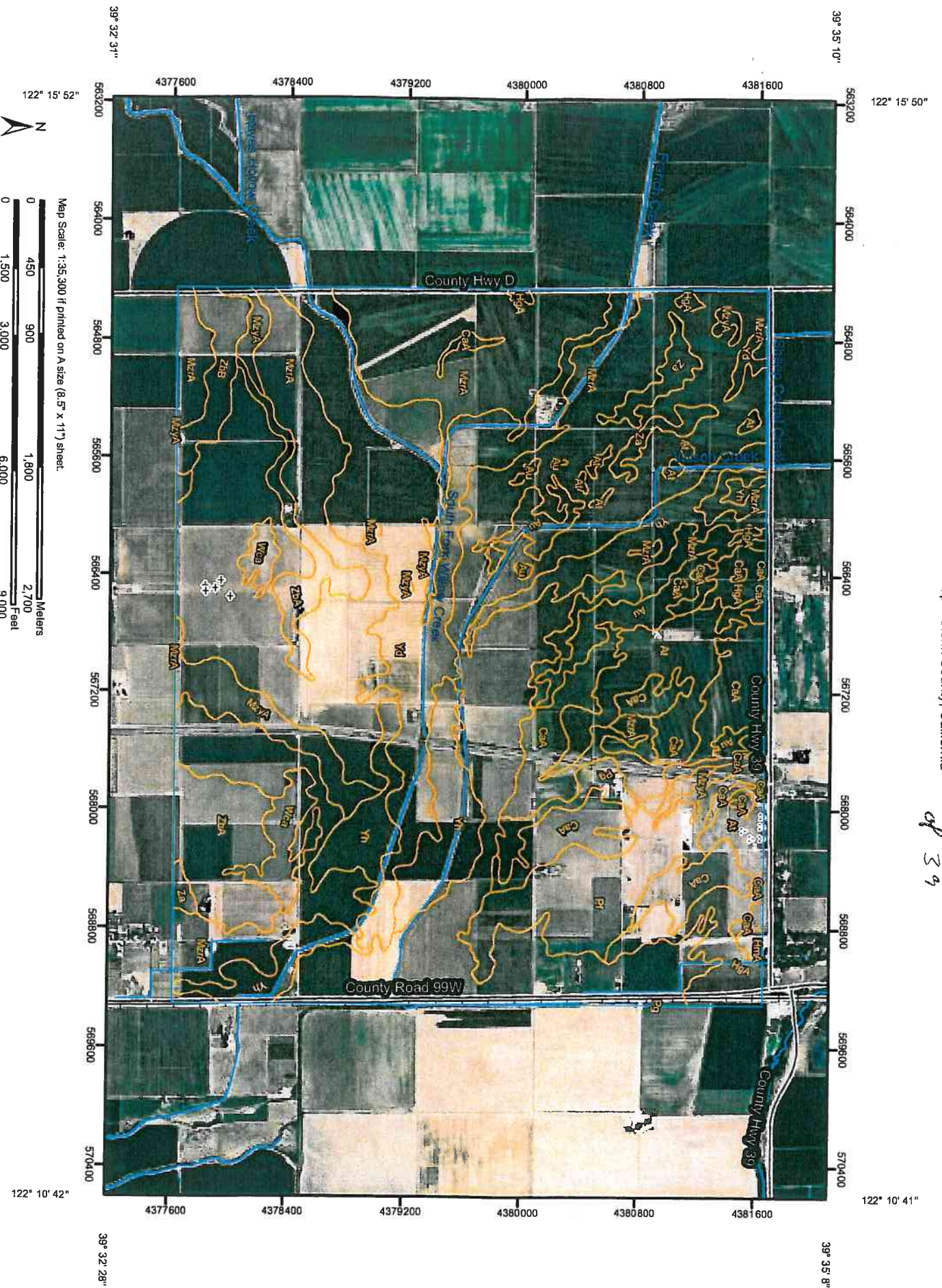


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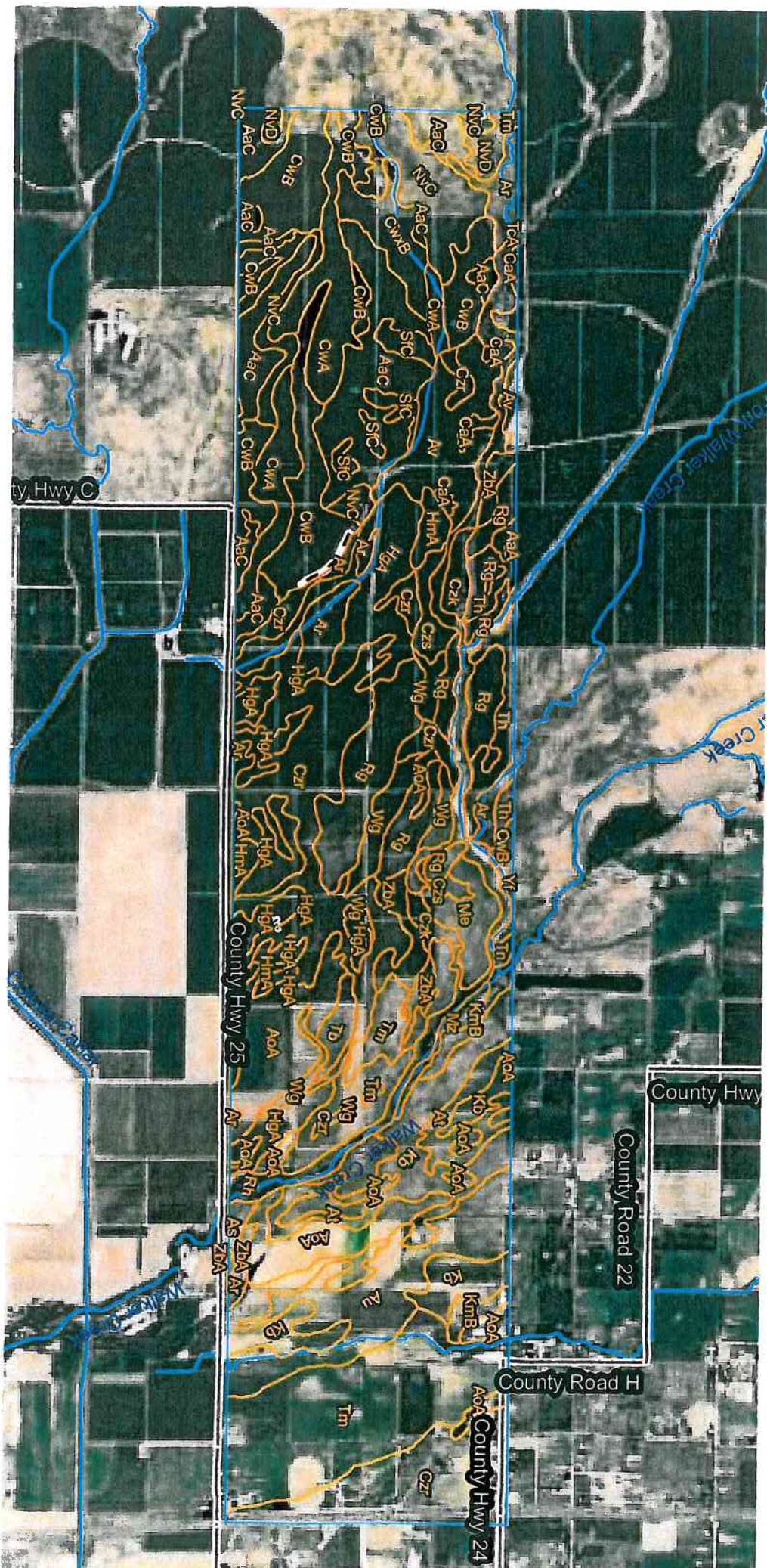


Soil Map—Glenn County, California

South of 39



100



Soil Map—Glenn County, California

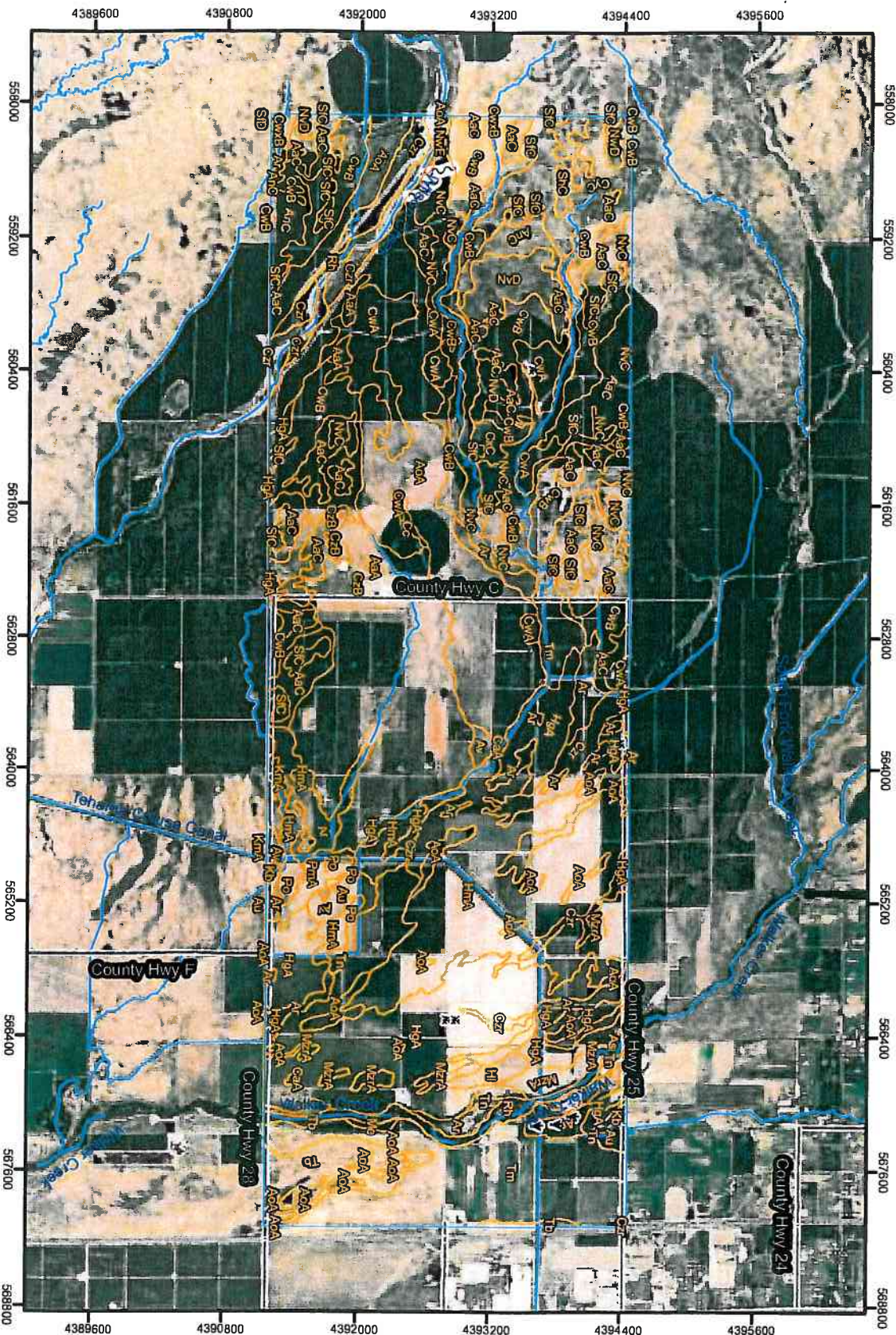
22

122° 19' 49"

39° 43' 3"

122° 11' 49"

39° 43' 0"



Map Scale: 1:54,500 if printed on A size (8.5" x 11") sheet.



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ATTACHMENT “C”

DISTRICT RULES AND REGULATIONS

ORLAND-ARTOIS WATER DISTRICT

RULES AND REGULATIONS FOR AGRICULTURAL WATER SERVICE

Approved October 19, 2004

1. The furnishing of water to and its use by, the applicant shall be subject to all regulations of the Board of Directors of the Orland-Artois Water District ("District") as the same may now or hereafter be amended or adopted.
2. Each year, on or before the application due date established by the District Board of Directors, before any water is delivered, every landowner must complete a District "Application for Agricultural Water" indicating each parcel of land for which he or she desires water service. If someone other than the landowner, such as a tenant, will be the water user, the water user must sign, in addition to the landowner. The application provides that the parties signing the application are jointly and severally liable for the District's charges. An application for water will not be accepted from any person who is delinquent for water, assessment, or other district charges, until all delinquencies are cured.
3. Any water furnished by the District is subject to the terms and conditions of the contract between the District and the United States (Bureau of Reclamation) under which said water is made available to the District. Landowners and water users are responsible for meeting the eligibility requirements of federal Reclamation law.
4. When the demand for water is greater than the available supply, the water shall be apportioned and distributed equitably as determined by the Board of Directors under California law, among those who have filed an application in accordance with paragraph 2 of these Rules and Regulations. The District's water supply is subject to restriction due to natural causes and the provisions of its Reclamation contract, and so the District does not guarantee the quantity, the rates of delivery, or the time of delivery.
5. The water furnished by the District is not potable and the District does not warrant the quality of water so furnished. ***NO DISTRICT WATER IS TO BE USED FOR HUMAN CONSUMPTION.*** The applicant agrees to indemnify, defend and hold the District harmless from all damage or claims of any nature, including attorney's fees, arising from the quality of water furnished by the District.
6. Payment for water and related charges shall be at the rate set by the Board of Directors of the District.
7. On or before the application due date each year, each water user making application shall pay a minimum "water advance" payment equivalent to the charge for one acre foot for each of that landowner's assessed acres that are recorded in the District's Assessment Roll. The total assessed acres will be used as a basis for calculating the advance payment. The total assessed acres may not be the same as the landowner's acres actually in production, nor the acres for which the landowner is actually applying for water that year. In the case where a landowner uses such a small amount of water that cannot be registered on the District meters, a monthly flat rate for minimum usage as determined by the Manager (as delegated by the Board) will be applied. No water shall be delivered until all of the advance payment is made. Payment for the remainder of the water ordered and delivered shall be billed monthly based on meter readings and following exhaustion of the "water advance" payment.

8. Monthly billings will be prepared for all water charges based on meter readings on or about the last day of each month.
9. Beginning March 1, 2005, all invoices for water, or for any other District services or charges, are due upon receipt and are delinquent when not paid within 30 days after the date of the bill. There shall be a penalty added of 10% to each invoice that is delinquent, plus a monthly interest charge of 1.5% on both the principal and the penalty.
10. Water service shall not be provided to any parcel of land for which the assessment, water charge or other District charges are delinquent. The District shall give the owner of the land and tenant, if any, notice before water service is terminated. The landowner, and tenant, if any, shall have the right to express any complaints or objections to the Manager, who has the authority to make a final determination in discontinuing water service, or recommending adjustments to the Board of Directors.
11. All accounts must remain current. Any water user who has a delinquent balance on December 1st of any given year will be required to post a higher water advance the following year. That rate will be calculated at 150% of the normal advance amount set for the year. For any water user who is delinquent on December 1st in 2 consecutive years, that user will be required to pay all of the estimated yearly water use in advance the following year.
12. An assessment on District land may be levied each year at a rate determined by the Board of Directors. Assessments may be charged on all District irrigable acres regardless of whether or not water was used. Standby or other charges may also be levied if determined necessary by the Board.
13. Any and all District costs incurred for the repair of the water outlet deliveries or related works as a result of landowner negligence or carelessness is to be paid by the landowner. A minimum \$50.00 charge will be levied for each occurrence, where meter tampering, outlet disfigurement or other inappropriate use is determined.
14. The District will not be liable for any damage caused by negligence or carelessness of any water user in the use of the water. In no event shall any liability accrue against the District or any of its officers, agents or employees for any damage arising directly or indirectly from or because of miscalculations in estimating needs, deficiency in water supply, drought or other unavoidable causes. In addition, the applicant hereby assumes responsibility for and agrees to indemnify, defend and hold the District harmless from all damages or claims for damage, including attorneys fees, which may arise from his/her use of the water after it leaves the District facilities.
15. The water ordering procedures approved by the Board on October 19, 2004 are incorporated within these Rules and Regulations.

ATTACHMENT “D”

POLICY ON WATER TRANSFERS

ORLAND-ARTOIS WATER DISTRICT

WATER TRANSFER POLICY

Adopted January 15, 2002

This is the policy of Orland-Artois Water District ("District") concerning transfer of water entitlements under its Central Valley Project ("CVP") water service contract and use of District facilities to convey non-Project water. This policy implements the transfer provisions of Title 34 of P.L. 102-575, the Central Valley Project Improvement Act ("CVPIA"), and is intended to be in compliance with the CVPIA as well as any applicable regulations or guidelines of the Bureau of Reclamation ("Reclamation"). This policy shall also be implemented as a supplement to and consistent with the District's other rules and regulations.

1. LANDOWNER INITIATED TRANSFERS WITHIN THE DISTRICT:

A landowner's Project water entitlement may be transferred for use on any land within the District, provided that:

- a. the landowner is in compliance with District regulations,
- b. prior written notice on the approved form has been provided to the District Manager, and the Manager has approved in writing, the provisions for delivering the Project water,
- c. all necessary agreements between the affected landowners, tenants or other water users, if any, and the District have been fully executed and delivered to the Manager, and
- d. the landowner has reimbursed all District costs in processing the request.

2. TRANSFERS CARRIED OUT BY THE DISTRICT WITHIN THE T-C SERVICE AREA:

It is the intent of the District to cooperate with landowners within the District who request transfers of all or a portion of their Project water entitlement as a District transfer within the service area of the Tehama-Colusa or Corning Canals (the "T-C Service area"). The District will evaluate such requests on a case-by-case basis, subject to all Reclamation guidelines and regulations, and the District's Rules and Regulations and policies in effect. A landowner's Project water entitlement may be transferred for use on land within the T-C service area provided that:

- a. the landowner is in compliance with District regulations,
- b. the transferor, if a tenant, has written approval of the landowner whose Project water entitlement is to be transferred,
- c. the transferor and the transferee are the same person or entity,
- d. prior written notice on the approved form has been provided to the District Manager, and the Manager has approved in writing the provisions and costs for delivering the Project water,
- e. all necessary agreements between the affected landowners, tenants or other water users, if any, and the Districts have been fully executed and delivered to the Manager, and,
- f. the landowner has reimbursed all District costs in processing the request.

3. TRANSFERS AUTHORIZED UNDER THE CVPIA:

a. LANDOWNER INITIATED TRANSFERS OUTSIDE OF THE DISTRICT:

i. Compliance with Laws and Regulations: All transfers shall be carried out in full compliance with Federal and State law, guidelines and regulations implementing Reclamation law, and District regulations. Such provisions shall prevail over any inconsistent provision of this policy.

ii. Who May Transfer: Only a District landowner who is in compliance with District regulations may transfer water.

iii. Quantity That May Be Transferred: Transfers will be limited to the lesser of
(1) the average amount of CVP water actually delivered to the landowner during the three years of normal water delivery prior to October 30, 1992; or

(2) the amount of Project water that would have been consumptively used by the landowner or irretrievably lost to beneficial use during the year or years of the transfer; and

(3) a reduced allocation resulting from reductions imposed upon the District by Reclamation in the year of the proposed transfer.

Project water "consumptively used" shall mean that portion of the water delivered to the landowner that would have been evapo-transpired by the crops, and does not include transportation losses, return flows, or deep percolation to usable groundwater basins. Consumptive use values are

1 developed by the University of California for the applicable region and crop.

2 iv. Application Procedure: The landowner shall prepare a transfer application and
3 all other documents and information as required by the Secretary of the Interior. The landowner
4 shall provide the District a copy of the application and all supporting correspondence and documents.

5 v. Limitation on Amount of Water Transferred: The CVPIA provides that transfers
6 involving more than 20% of the supply available in a particular year to the District under its CVP
7 contract shall be subject to the District's review and approval. If applications for transfers submitted
8 before the deadline for district water applications exceed the 20% cumulative limitation, the District
9 will pro-rate those applications based upon the ratio that the amount of water to be transferred under
10 an application bears to the total amount of water to be transferred under all the applications filed
11 before that water application deadline date. For purposes of determining the 20% cumulative
12 limitation, the District will consider applications for transfers submitted after the deadline date for
13 annual applications for water service in the order in which they are applied for, in determining
14 whether a particular transfer will exceed the 20% cumulative limitation.

15 vi. Conditions to protect others:

16 The District shall review the application to determine whether it is equitable and
17 otherwise consistent with the District's authority, powers and purposes. Without limiting the
18 foregoing, the District will consider whether the proposed transfer will have unreasonable impacts
19 on the water supply, operations or financial condition of the District and its water users, including,
20 but not limited to, the impact of the proposed transfer, if any, on the District's groundwater
21 conjunctive use project.

22 vii. Public Notice Requirement: In accordance with the CVPIA, the District is
23 required to provide public notice in connection with its review of water transfers that involve transfer
24 of more than 20% of the District's Project water supply. The District shall publish notice of such
25 a proposed transfer one time in a newspaper of general circulation no less than 60 days before a
26 public hearing to consider the transfer. At that time, members of the public will have an opportunity
27 to comment orally and in writing on the transfer proposal.
28

viii. Compliance with CEQA: At the time of filing a transfer application, the landowner shall notify the District whether it requests the District to be the lead agency for purposes of compliance with the California Environmental Quality Act in connection with any transfer proposal to which CEQA will apply.

ix. Reimbursement of District Costs: The landowner making application to transfer water shall be responsible for all costs associated with processing the transfer application, including reimbursement of the District's lost revenue on the water to be transferred, and the cost of water the District must acquire, if any, in order to carry out its groundwater conjunctive use project. In addition, the landowner must reimburse the District for the District's actual costs, and consultant fees incurred, in reviewing and processing the transfer application. The District shall estimate the amount of such costs and shall require the landowner to deposit with the District an amount sufficient to reimburse the District's estimated cost in advance of the District considering the transfer proposal. The District may from time to time revise the estimate of costs, and require an additional deposit.

x. Long-Term Transfers: The District reserves the right annually to review all long-term transfers to ensure that the transfer is being carried out in accordance with this policy, to confirm the amount of water available for transfer under the proposal and to re-evaluate any conditions imposed by the District on the transfer to avoid the impacts set forth in Article 3.a.vi

b. TRANSFERS CARRIED OUT BY THE DISTRICT: The CVPIA authorizes a transfer between CVP contractors within counties, watersheds or other areas of origin, as those terms are used under California law. Such transfers carried out by the District are not limited to (a) the three prior year average quantity of water actually delivered by the District, or (b) the amount of water that would have been consumptively used or irretrievably lost in the absence of the transfer. The District will cooperate with landowners within the District who request the District to transfer their Project water entitlement as a District transfer under these provisions, instead of as a landowner transfer under Section 3.a of this policy, to better maximize the amount of water available for transfer by the landowners. The District will evaluate such requests on a case-by-case basis to determine whether it is equitable and otherwise consistent with the District's authority, powers and purposes, and

whether it otherwise meets the criteria of Article 3.a.vi. Generally, the District will require that it receive up to 50% of the revenue received from such a transfer, or a fee representing 50% of the value of the transferred water, in addition to being reimbursed for all of its costs in connection with processing the transfer proposal.

4. USE OF DISTRICT FACILITIES TO TRANSFER NON-PROJECT WATER:

The District will consider on a case-by-case basis requests to use District facilities to transfer non-Project water. Such transfers shall be approved in writing in advance by the District, subject to appropriate conditions determined by the District as necessary to protect its facilities and the rights of other water users to District water service. The use of District facilities for this purpose may also be subject to conditions that the Bureau of Reclamation may impose under the terms of the District's contracts with the United States.

5. AMENDMENT OF POLICY: This policy shall be administered by the District Manager, and shall be subject to revision from time to time by the Board of Directors.

ATTACHMENT “E”

DISTRICT SAMPLE BILL

ORLAND-ARTOIS WATER DISTRICT
P.O.BOX 218
ORLAND, CA 95963
(530) 865-4304

MAY WATER USAGE

MARION & DIANA KIRBY
6905 ROAD 27

ORLAND CA 95963

FIXED

Invoice No: I 08820
Page No: 1
Date: 06/16/08
Customer: KIRBM
Terms Code: FC

Description	-----METER READINGS-----				Units	UM	Rate	Total
	Date	Previous	Date	Current				
B-42	MARION & DIANA KIRBY							
BASE PRICE	07/11/00		06/16/08		2.79		33.5000	2

CHARGES FOR CURRENT MONTH	93.47
PREVIOUS BALANCE	1,076.61-
TOTAL BALANCE DUE	983.14-

Cut here and return lower portion with payment

Return To:

ORLAND-ARTOIS WATER DISTRICT
P.O.BOX 218
ORLAND, CA 95963
(530) 865-4304

MAY WATER USAGE

Invoice No: I 08820
Date: 06/16/08
Customer: KIRBM

TOTAL BALANCE DUE

983.14-

"Pay Amount"-----> \$ _____

Monthly Usage Summary By Tenant (non-financial)



Billing Period: May 2008

Water District: *Orland-Artois Water District*
PO Box 218, Orland
CA, 95963-

Tenant: MARION & DIANA KIRBY
. 6905 Co. Rd. 27
ORLAND, CA95963-

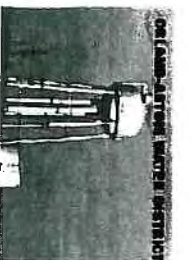
						<u>Current Usage</u>	<u>Cumulative Usage</u>
<i>Meter</i>	<i>Order Amount</i>	<i>Previous Reading</i>	<i>Recorded</i>	<i>Latest Reading</i>	<i>Recorded</i>	<i>Meter Usage</i>	<i>Meter Usage</i>
B-42	271.21	43.12	4/29/08	45.91	5/22/08	2.79	5.21
<i>Total:</i>						2.79	5.21



Orland-Artois Water District
PO Box 218
Orland CA, 95963-

Monthly Water Usage Report

Year: 2008



No.: KIRBM

Tenant: MARION & DIANA KIRBY

. 6905 Co. Rd. 27

ORLAND, CA 95963-

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Annual
Turnout	Usage	Usage	Usage	Usage	Usage	Usage	Usage	Usage	Usage	Usage	Usage	Usage	Usage
1 B-42	1.52	0.91	2.79	3.62	3.80	2.24	3.30	0.00	0.00	0.00	0.00	0.00	18.18
Total:	1.52	0.91	2.79	3.62	3.80	2.24	3.30	0.00	0.00	0.00	0.00	0.00	18.18

Total Irrigable Acres: 18.50 Acres

Allocation: 0.86 Acre-Fee/Acre

Total Base Allocation: 15.91 A/F

Total Inter-District Transfer: 0.00 A/F

Total Intra-District Transfer: 0.00 A/F

Total Water Available: 15.91 A/F

Total Water Delivered to Date: 18.18 A/F

Net water left: -2.27 A/F

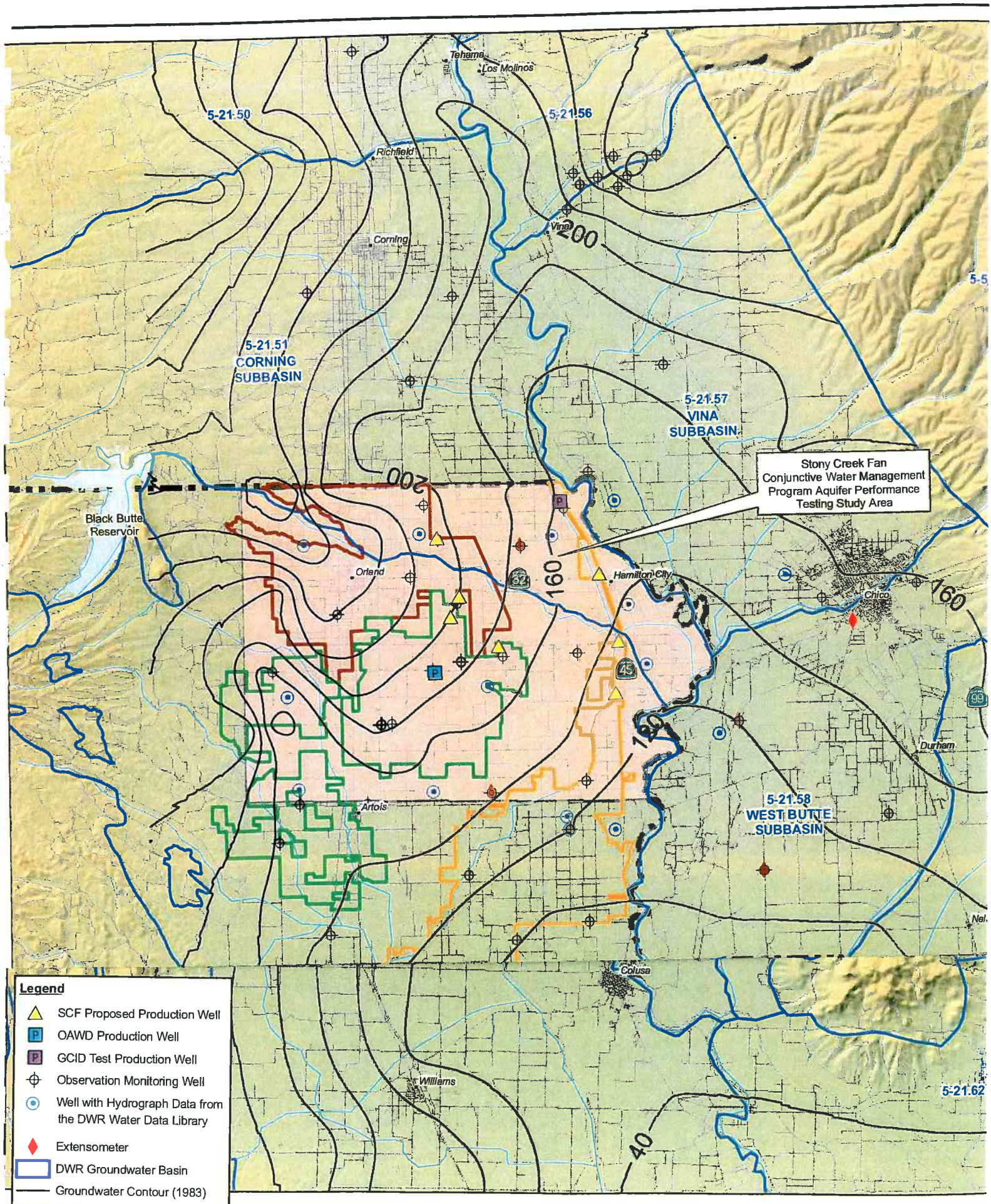
Which is (0.98 Acre Feet/Acre)

Which is (-0.12 Acre Feet/Acre)












ATTACHMENT “F”

DISTRICT MAP OF GROUNDWATER
FACILITIES



Legend

-  SCF Proposed Production Well
-  OAWD Production Well
-  GCID Test Production Well
-  Observation Monitoring Well
-  Well with Hydrograph Data from the DWR Water Data Library
-  Extensometer
-  DWR Groundwater Basin
-  Groundwater Contour (1983)
-  GCID Boundary

ATTACHMENT “G”

GROUNDWATER MANAGEMENT PLAN

Orland-Artois Water District Groundwater Management Plan

**Prepared pursuant to the Groundwater Management Act
(AB 3030)**

**Prepared by
Davids Engineering, Inc.
Davis, CA**

January 2002

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I. INTRODUCTION

A. Groundwater Management Act

Groundwater is used extensively to meet water supply requirements in many areas throughout California. For these reasons, the California State Legislature has declared groundwater a valuable natural resource, and has determined that groundwater should be managed to ensure both its safe production and its quality. The Groundwater Management Act (AB 3030) was passed by the State Legislature in 1992 and became law January 1, 1993. The act is codified as Sections 10750 *et seq.* of the California Water Code.

This groundwater management plan, prepared by Orland-Artois Water District (OAWD or the District), has been developed pursuant to the provisions of AB 3030. The District overlies the Sacramento Valley Groundwater Basin, as defined by the State Department of Water Resources in Bulletin 118-80, Groundwater Basins in California (DWR 1980).

B. Plan Components

According to California Water Code Section 10753.7, a groundwater management plan may include components relating to any or all of the following:

- Control of saline water intrusion
- Identification and management of wellhead protection areas and recharge areas
- Regulation of the migration of contaminated groundwater
- Administration of a well abandonment and well destruction program
- Mitigation of conditions of overdraft
- Replenishment of groundwater extracted by water producers
- Monitoring of groundwater levels and storage
- Facilitating conjunctive use operations
- Identification of well construction policies
- Construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling and extraction projects
- Development of relationships with state and federal regulatory agencies
- Review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination

OAWD has selected the following seven components for its groundwater management plan. They are to:

1. Monitor Groundwater Levels and Quality
2. Facilitate Conjunctive Use Operations
3. Implement Aquifer Storage and Recovery
4. Construct Groundwater Management Facilities
5. Support County Wellhead Protection Program
6. Promote Water Conservation
7. Comply with Glenn County's Basin Management Objectives Program

Each of these is described in Section V.

C. Agency Authorization

California Water Code Section 10753 (a) authorizes any local agency, whose service area includes a groundwater basin, or a portion of a groundwater basin, that is not already subject to groundwater management, to adopt and implement a groundwater management plan. Section 10752 (e) defines a groundwater management plan as “a document that describes the activities intended to be included in a groundwater management program.” A groundwater management program is defined by Section 10752 (d) as “a coordinated and ongoing activity undertaken for the benefit of a groundwater basin, or a portion of a groundwater basin, pursuant to a groundwater management plan adopted pursuant to this part.

“Local agency” is defined as any local public agency that provides water service to all or a portion of its service area (Section 10752 (g)). The definition also includes a local public agency that provides flood control, groundwater management, or groundwater replenishment, or a local agency formed pursuant to the Water Code for the principal purpose of providing water service that has not yet provided that service (Section 10753 (b)). These local agencies may exercise the authority of this part, and are authorized by Section 10752 (g) to form Joint Powers Authorities in order to work cooperatively in establishing a groundwater management program.

According to Water Code Section 10754, for purposes of groundwater management, a local agency that adopts a groundwater management plan has the authority of a water replenishment district pursuant to Part 4 (commencing with Section 60220) of Division 18 and may fix and collect fees and assessments for groundwater management in accordance with Part 6 (commencing with Section 60300) of Division 18, subject to the approval of voters within the agency’s boundaries.

D. Eligible Groundwater Basins

The act applies to all groundwater basins in the state of California, except those already subject to groundwater management by a local agency or watermaster pursuant to other provisions of law or a court order, judgment or decree, unless the local agency or watermaster agrees to the applications of the act. The Sacramento Valley Groundwater Basin is eligible for groundwater management under AB 3030.

E. Objective of Plan

OAWD values the importance of groundwater in the state of California as well as locally. It recognizes that proper management of groundwater basins is necessary to sustain the environmental, social and economic conditions that prevail in today’s society. More importantly, the well being of future societies is dependent on the effectiveness of current groundwater resources planning, development and management. For these reasons, the District elected to prepare a Groundwater Management Plan to protect the groundwater in its area and the Sacramento Valley Groundwater Basin.

The objective of this groundwater management plan is to identify and implement a Program of effective groundwater management practices that will maintain the long-term availability of groundwater, protect groundwater quality and prevent land subsidence within the District.

F. Relationship to Glenn County

Glenn County has adopted an ordinance to govern the management of groundwater county-wide. The philosophy expressed in the draft ordinance is for the County “to work cooperatively with interested local agencies to further develop and implement joint groundwater management practices”. The District regards itself as an interested local agency, and expresses its intent to work cooperatively with the County toward mutually agreeable groundwater management objectives. However, by development and adoption of this Plan, the District asserts that it holds sole legal authority for management of the District’s groundwater resources.

II. Sacramento Valley Groundwater Basin

A. Boundaries

The Sacramento Valley Groundwater Basin encompasses approximately 4900 square miles including all of Sutter County, and parts of Yuba, Tehama, Glenn, Butte, Colusa, Yolo, Solano, Placer and Sacramento Counties. Its usable storage capacity has been estimated at approximately 40 million acre-feet (CALFED, 2000), making it one of California's largest groundwater basins.

The Sacramento Valley Groundwater Basin has been partitioned by the California Department of Water Resources into groundwater sub-basins based on natural hydrologic boundaries. The largest sub-basin in the Sacramento Valley Groundwater Basin is the Colusa Sub-Basin.

The Colusa Sub-Basin lies on the West Side of the Sacramento Valley Groundwater Basin (Figure 1). The northern boundary of the basin runs easterly from Black Butte Reservoir, along Stony Creek. The southern boundary runs along Cache Creek. The Coast Range in the West and the Sacramento River in the East bound the basin. The Orland-Artois Water District lies over the northern portion of the Sub-Basin, just south of Stony Creek.

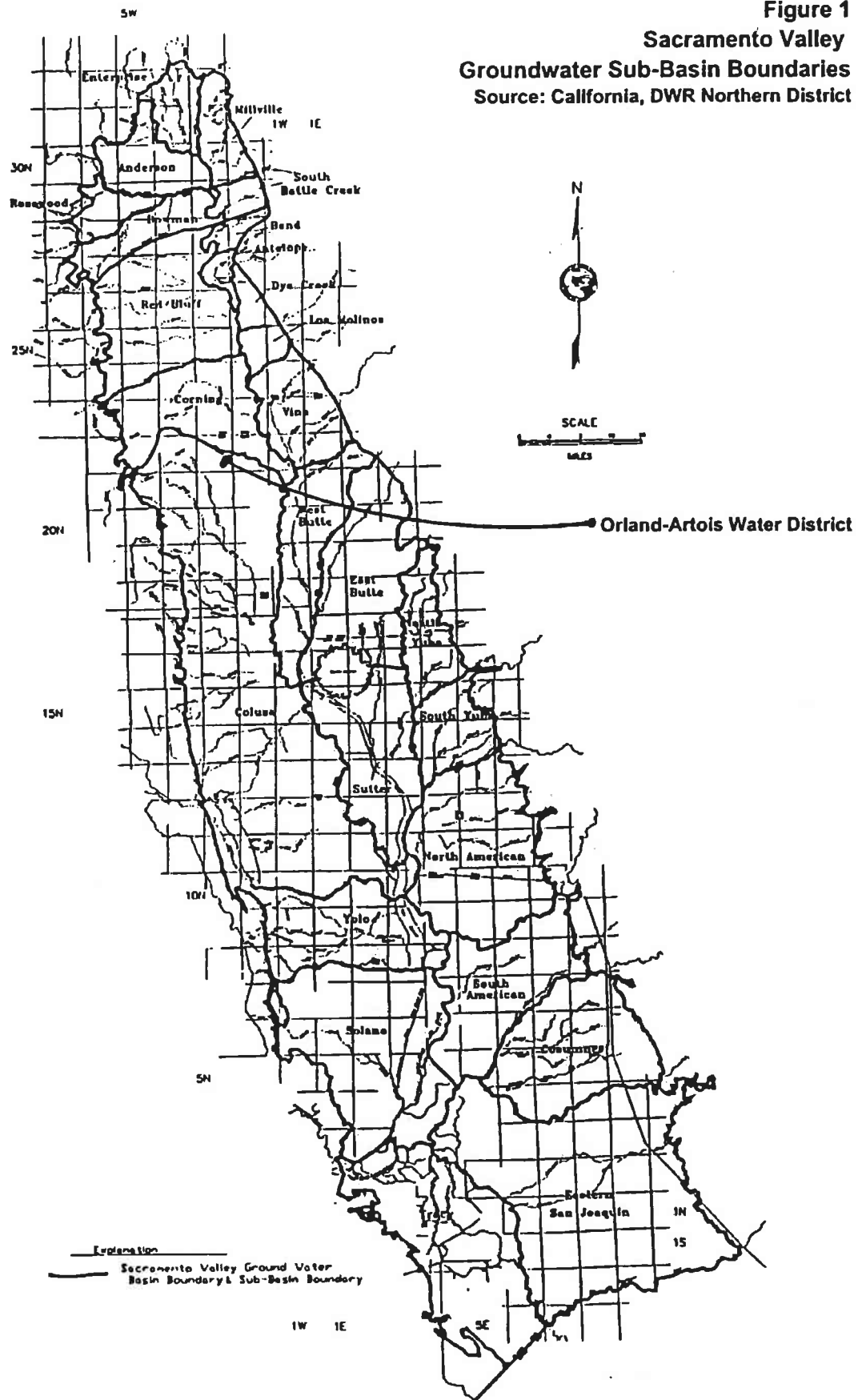
B. Agencies Within The Colusa Sub-Basin

In addition to the Orland-Artois Water District, there are five Irrigation Districts, 11 Water Districts, six other Districts, and five private pumper areas that lie completely or partially within the Colusa Sub-Basin (Table 1). Lands within the boundaries of these districts, as well as unorganized lands within the Sub-Basin, are excluded from this plan.

Table 1. Irrigation Districts, Water Districts, Other Districts and Private Pumper Areas Within the Colusa Sub-Basin

IRRIGATION DISTRICTS	WATER DISTRICTS	OTHER DISTRICTS	PRIVATE PUMPER AREAS
Glenn - Colusa	Orland-Artois	Orland Unit W.U.A.	East Corning Basin Private Pumpers
Provident	Glide	Willow Creek M.W.C.	West Corning Basin Private Pumpers
Princeton-Cordora-Glenn	Kanawha	Maxwell P.U.D.	BOS District 5 Private Pumpers
Maxwell	Holthouse	Colusa Drain W.U.A.	BOS District 3 Private Pumpers
La Grande	4-M	Myers Marsh M.W.C.	West Colusa Basin Private Pumpers
	Glenn Valley	Reclamation District 108	
	La Grande		
	Davis		
	Westside		
	Cortina		
	Colusa County		
	Dunnigan		

Figure 1
Sacramento Valley
Groundwater Sub-Basin Boundaries
 Source: California, DWR Northern District



C. Subsurface Geology

The stratigraphy of the Colusa Sub-Basin area includes a non-water-bearing complex and various water bearing sediments on top of the basement complex. The basement complex consists of granitic and metamorphic rocks, which do not yield water freely to wells. The basement complex is overlain by continental deposits of late Tertiary and Quaternary age. Deposits from the Quaternary age include alluvial, flood basin and deposits from the Modesto, Riverbank and Red Bluff Formations. Deposits from the Tertiary age consist of the Tehama and Tuscan Formations.

The principle water-bearing complex of the Colusa Sub-Basin aquifer system is comprised of late tertiary age deposits from the Tehama Formation. The Tehama Formation consists of thick deposits of silt and clay interbedded with thin layers of lenticular sand and gravel. Permeability varies throughout the formation. In the northern part of the Sub Basin, there is a higher percentage of gravel that was deposited from the ancestral Stony Creek. This area can produce a significant quantity of water to wells. Outside the Stony Creek member of the Tehama formation, permeability is low to moderate due to a higher percentage of fine-grained sediments and the presence of hardpan layers.

The Tuscan Formation is a water-bearing complex located in the Northeast section of the Sub-Basin. It consists of interbedded volcanic lava flow, mudflow, conglomerate and tuff. Permeability is found to be higher in this formation than the Tehama Formation, although the Tuscan Formation is less utilized.

The older alluvium deposits overlie the low plain found in the western portion of the Colusa Sub-Basin. They are interspersed with deposits from the Tehama formation. The older alluvium consists of gravel, sand, silt and clay.

The younger alluvium consists of Basin deposits and alluvium. Basin deposits consist of fine-grained silt and clay and are found in the flood basin area adjacent to streams. Permeability is low through these deposits. Younger alluvium deposits are found along the Sacramento River. These deposits consist of unconsolidated, unweathered gravel, sand, silt and clay. Permeability is moderate to high due to a higher percentage of gravel and sand as opposed to Flood Basin deposits.

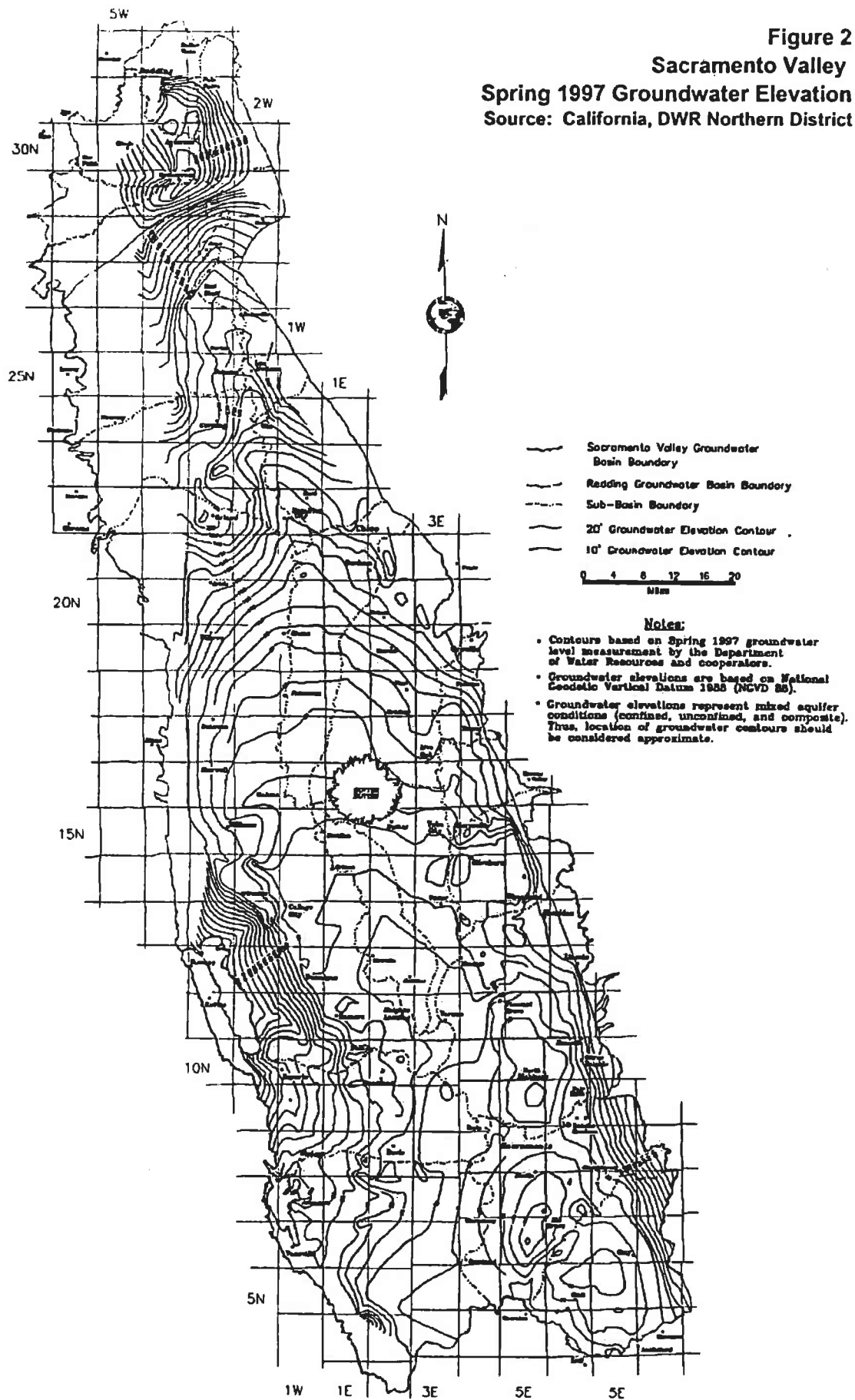
Natural groundwater recharge to the Colusa Sub-Basin is in the form of surface water recharge from Cache Creek, Stony Creek, and the Sacramento River, infiltration from precipitation, and groundwater baseflow from the western and eastern parts of the sub-basin. Most recharge to the area is in the form of deep percolation of applied irrigation water.

Groundwater Basin information was provided by the Northern District, California Department of Water Resources as part of the Sacramento River Basin-Wide Management Plan; Groundwater Hydrology Technical Memorandum.

D. Groundwater Conditions In The Orland-Artois Water District

Based on spring 1997 groundwater elevations (Figure 2), it appears that Stony Creek serves as a source of recharge to the Sub-basin and that groundwater flow is in the northwest to southeast direction. The United States Bureau of Reclamation (USBR, 1988) reported that groundwater recharge within the District is primarily from deep percolation of applied irrigation water. Other sources of groundwater recharge to the District included surface stream recharge and deep percolation of precipitation.

Figure 2
Sacramento Valley
Spring 1997 Groundwater Elevation
 Source: California, DWR Northern District



III. EXISTING CONDITIONS IN THE DISTRICT

A. District History

The District is located generally between the towns of Orland and Artois, in the northwest portion of the Sacramento Valley (Figure 3). The District is comprised of 30,290 acres of land interspersed with non-district lands in a checkerboard-like pattern. The District's assessed (irrigable) area is 28,988 acres.

The District was formed in 1954 for the purpose of contracting with the Bureau of Reclamation for a supplemental surface water supply. Contract 14-06-200-8283A was entered into between the District and the Bureau in 1963, and water deliveries began in 1976, with completion of the District's distribution facilities. The contract had a 53,000 acre-foot annual contract amount. Since the expiration of that contract in 1995, the District has continued to receive Central Valley Project (CVP) water under a series of two-year interim contracts with Reclamation, each with the same contract amount as the original contract (53,000 acre-feet). Along with other historical CVP water contractors, the District is currently negotiating a new long-term water supply contract.

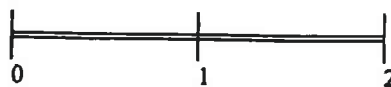
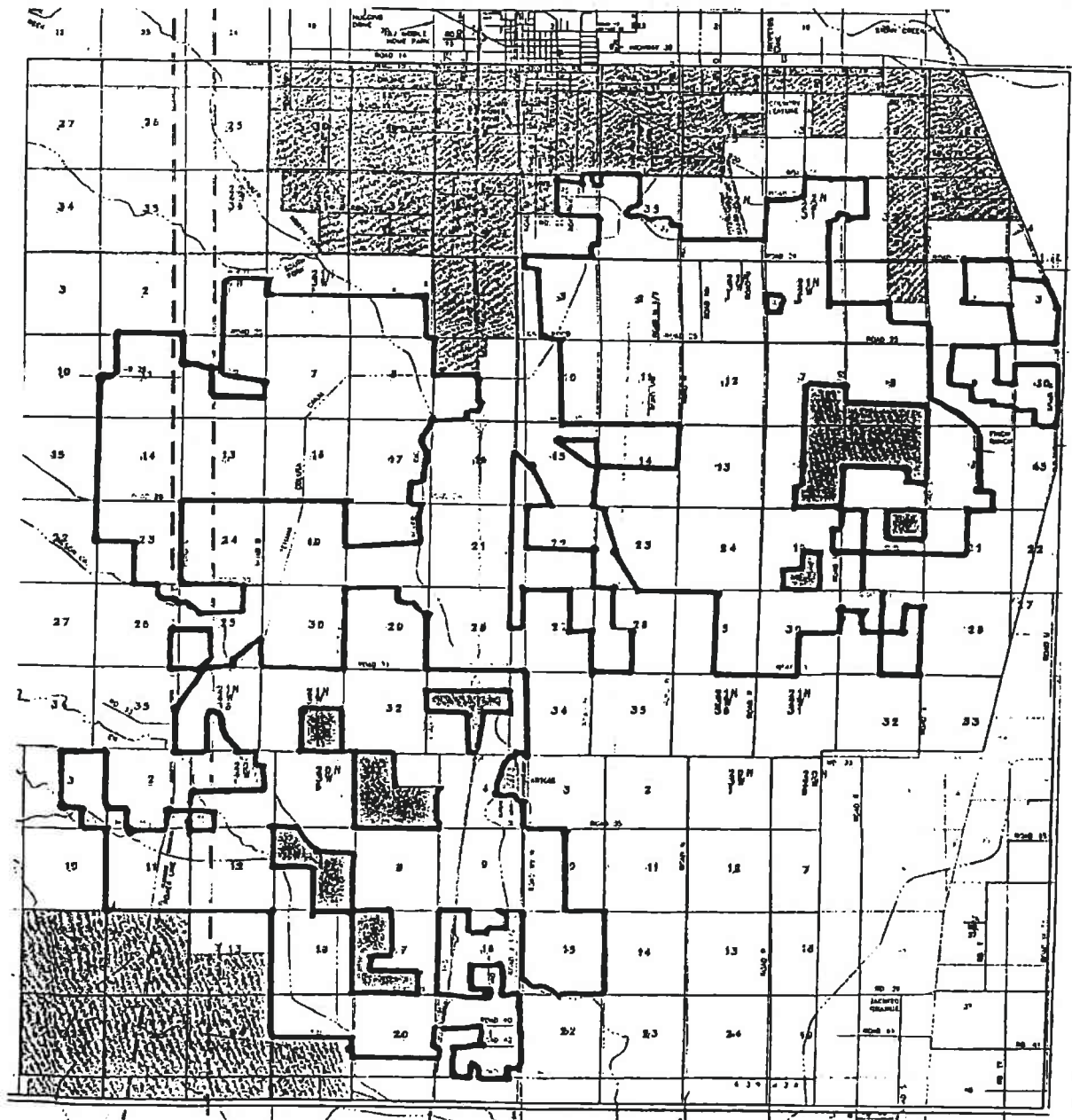
B. District Facilities

OAWD owns and operates a buried pipeline distribution system that conveys CVP water from the Tehama-Colusa Canal to District lands. There is a total of 100 miles of pipeline with diameters ranging from 8 to 96 inches. Water deliveries to farms are measured with totalizing flow meters. The combined delivery capacity through the 5 permanent and 3 temporary turnouts from the Tehama-Colusa Canal is 427 cubic feet per second. Deliveries to lands lying down gradient (generally east) of the Tehama-Colusa Canal are made by gravity while up-gradient deliveries are made by canal side pumping plants.

C. Cropping Patterns and Irrigation Systems

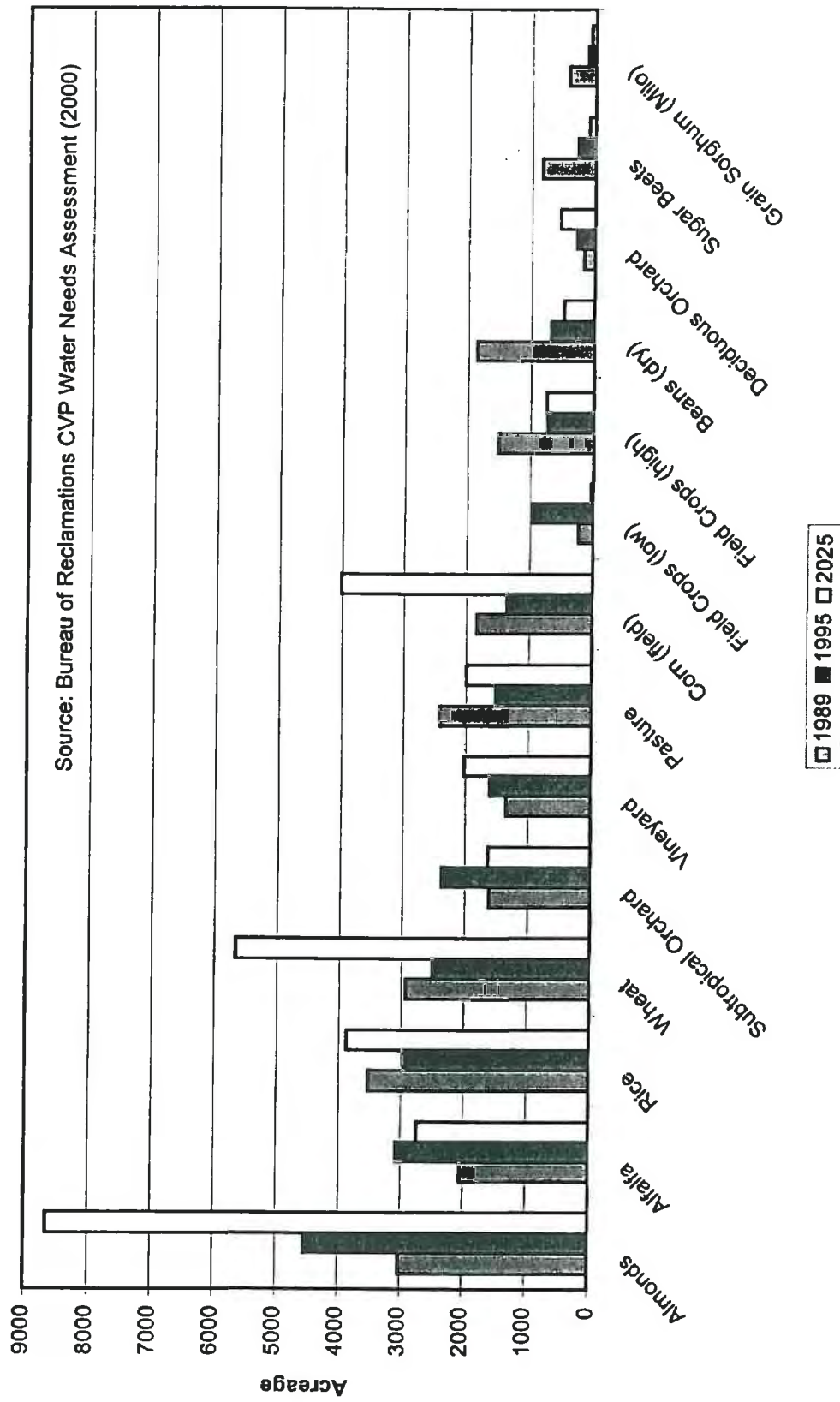
Historically, the trend in irrigated agriculture within the District area (Figure 4) is that acreage in permanent crops (almonds, vineyards, and subtropical and deciduous orchards) has been increasing. Based on predictions of future cropping patterns made by the BOR in the Water Needs Assessment (2000), this trend will continue with an intensification of acreage cultivated with almonds. Reclamation also foresees that District irrigated acreage will increase by an additional 9000 acres in the year 2025 based on recent trends of double cropping. This is reflected by the dramatic increase in acreage that will be cultivated with winter wheat and field corn. Other prominent crops grown in the District are alfalfa, rice and irrigated pasture. Land planted with these crops will essentially remain at the current level.

Figure 3
Orland-Artois Water District



(Approximate scale)

Figure 4
Orland-Artois Water District
Historical and Future Land Usage



Approximately 75% of the total irrigated acreage in 1999 was surface irrigated, 12% was sprinkler irrigated and 13% was drip irrigated. Growers in the district have gradually shifted to sprinkle and drip irrigation methods, dependant on the crop.

D. Climate and Precipitation

The District climate is characterized by hot dry summers and mild winters accompanied by moderate precipitation. Average annual precipitation at Orland, located immediately north of the District, is about 21 inches for the period 1948 to 2000 (Western Regional Climate Center, 2000). On average, 72 percent of the annual precipitation occurs in the 7-month period from October to April.

The dry climate is well suited for irrigated agriculture. The long, warm-to-hot dry summers allow ripening of crops without the threat of mildew. The summers are typically without precipitation, permitting the attainment of high irrigation efficiencies. Winter precipitation provides some water for winter crops and contributes to groundwater recharge and leaching of salts from the root zone.

IV. DISTRICT WATER DEMANDS AND SUPPLIES

A. Water Demand

The demand for irrigation water in the District is determined primarily by the crops grown on District lands, climatic factors, and on-farm irrigation systems and management. Reclamation has recently completed a water needs analysis for the District as part of the CVP long-term contract renewal process. The analysis shows that under recent historical conditions, the District has had an average farm delivery requirement of 3.31 acre-feet per acre, resulting in a total demand of about 79,000 acre-feet on the District's approximately 23,700 presently-irrigated acres (including double-cropped lands). This computation is based on an assumed aggregate district efficiency of 75 percent and reflects the contribution of precipitation toward meeting crop water requirements.

Based on recent trends toward increased double cropping in the District, Reclamation's water needs analysis assumes that District irrigated acreage will increase to nearly 32,600 acres by 2025. This will result in a total demand of nearly 101,000 acre-feet, and an average farm delivery requirement of 3.10 acre-feet per acre. This demand, based on an aggregate district efficiency of 80 percent, represents a 28 percent increase in irrigation water demand relative to existing conditions.

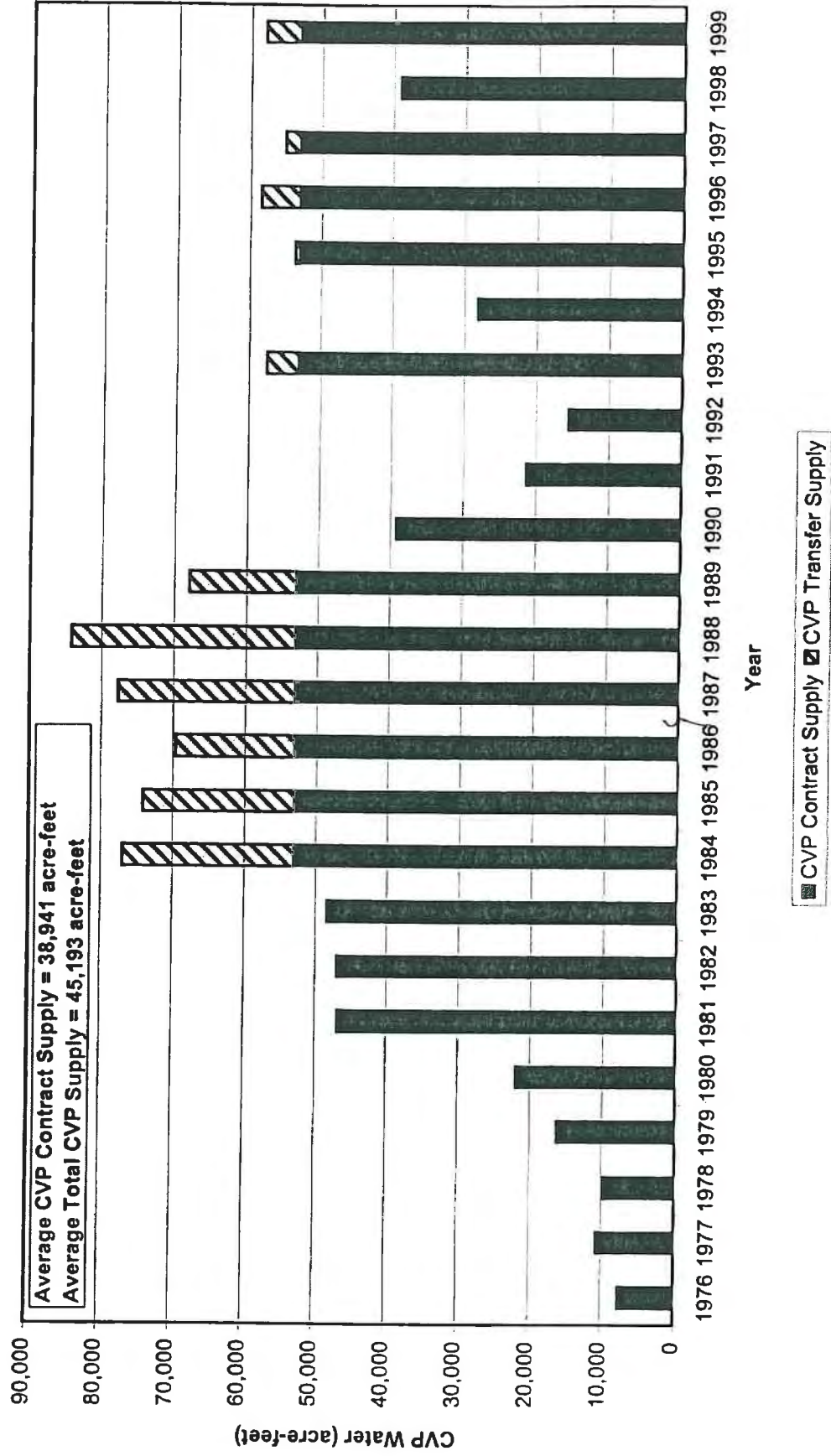
B. Water Supplies

The District has two principal sources of irrigation water, including groundwater and supplemental surface water from the CVP. Since the start of District operations in 1976, CVP contract deliveries have ranged from a low of 7,612 acre-feet in 1976, up to the contract maximum of 53,000 acre-feet in 11 of the years between 1976 and 1999 (Figure 5). The average CVP contract supply has been 38,941 acre-feet over the same period.

In addition to water received under its federal contract, the District has been able to acquire CVP water through water transfers from other CVP water contractors. Water transfers have occurred in 11 of the 25 years between 1976 and 1999 (Figure 5), yielding the most water during the period from 1984 through 1989. In recent years, transfers have yielded significantly less water, due substantially to the effects on Project operations of the Central Valley Project Improvement Act, which came into effect in 1992.

Apparent in the graph is the variability in surface water supplies from year to year. When water was abundant during the wet years of the mid-1980's, surface water supplies, from the annual contract and water transfers, were at a maximum level. During the drought years in the early 1990's water deliveries declined.

Figure 5
Orland-Artois Water District
Total Annual CVP Water Supply



The District does not own or operate groundwater production wells; however, some private landowners have constructed wells that they used in conjunction with District-provided CVP water to meet irrigation demands. The District does not maintain records of private well construction or groundwater production. However, each year since 1990, the District has prepared an estimate of private groundwater pumping based on estimates of average farm delivery requirements and records of District surface water sales. When viewed in conjunction with surface water sales, it is evident that private groundwater pumping is used to supplement available CVP surface water, with groundwater pumping rising in dry years and falling in wet years (Figure 6). Over the period 1990 through 1999, groundwater pumping has averaged 25,278 acre-feet and the combined surface water and groundwater supply has averaged 66,165 acre-feet.

Groundwater levels in wells¹ are monitored Statewide by the Department of Water Resources, including several wells in the OAWD. For purposes of developing this Plan, four wells with long-term records were chosen to represent groundwater levels within the District, each generally representing one quadrant of the District (Figure 7). Two of the wells (and possibly others), those in the southwest and northeast quadrants, have continuous records dating from the 1940s. It appears from those records that groundwater levels, while variable from year to year, were generally stable into the mid-1970s. Pronounced water level declines are evident in both wells in 1972 and in 1976.

Between the mid-1970s and mid-1980s, water levels in all four wells rose, most likely reflecting a response to high surface water use and relaxed groundwater pumping during that period. Since the mid-1980s, water levels in all wells have varied, but there are no apparent long-term upward or downward trends evident in any of the wells. This would suggest that current levels of groundwater production are sustainable. However, expected increases in future water demands, coupled with possible reduced reliability of CVP water supplies, may well lead to increased reliance on groundwater supplies and the possibility of declining water levels.

The four wells selected for development of this Plan (see preceding paragraphs) may or may not be used for future groundwater monitoring purposes.

C. Groundwater Quality

The District has not conducted water quality testing, but groundwater is considered to be good for irrigation purposes. District farmers report that cropping choices are not restricted with respect to water quality. However, two groundwater quality problems have been identified in the city of Orland just north of the District.

¹ DWR monitors levels in both production and monitoring wells; production wells may or may not be in active use.

Figure 6
Orland-Artois Water District
Surface Water and Groundwater Supplies
(From 1990 To 1999)

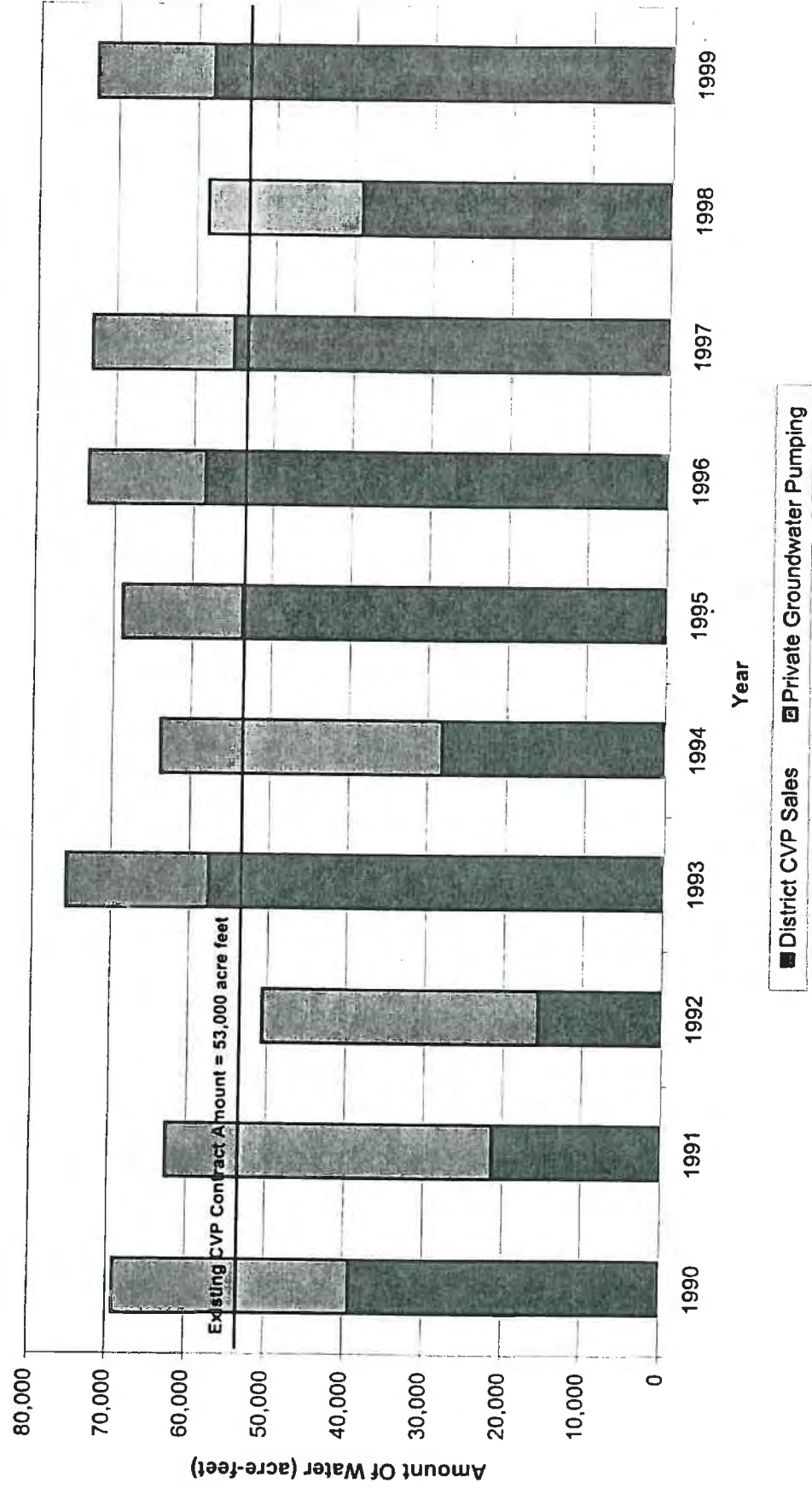
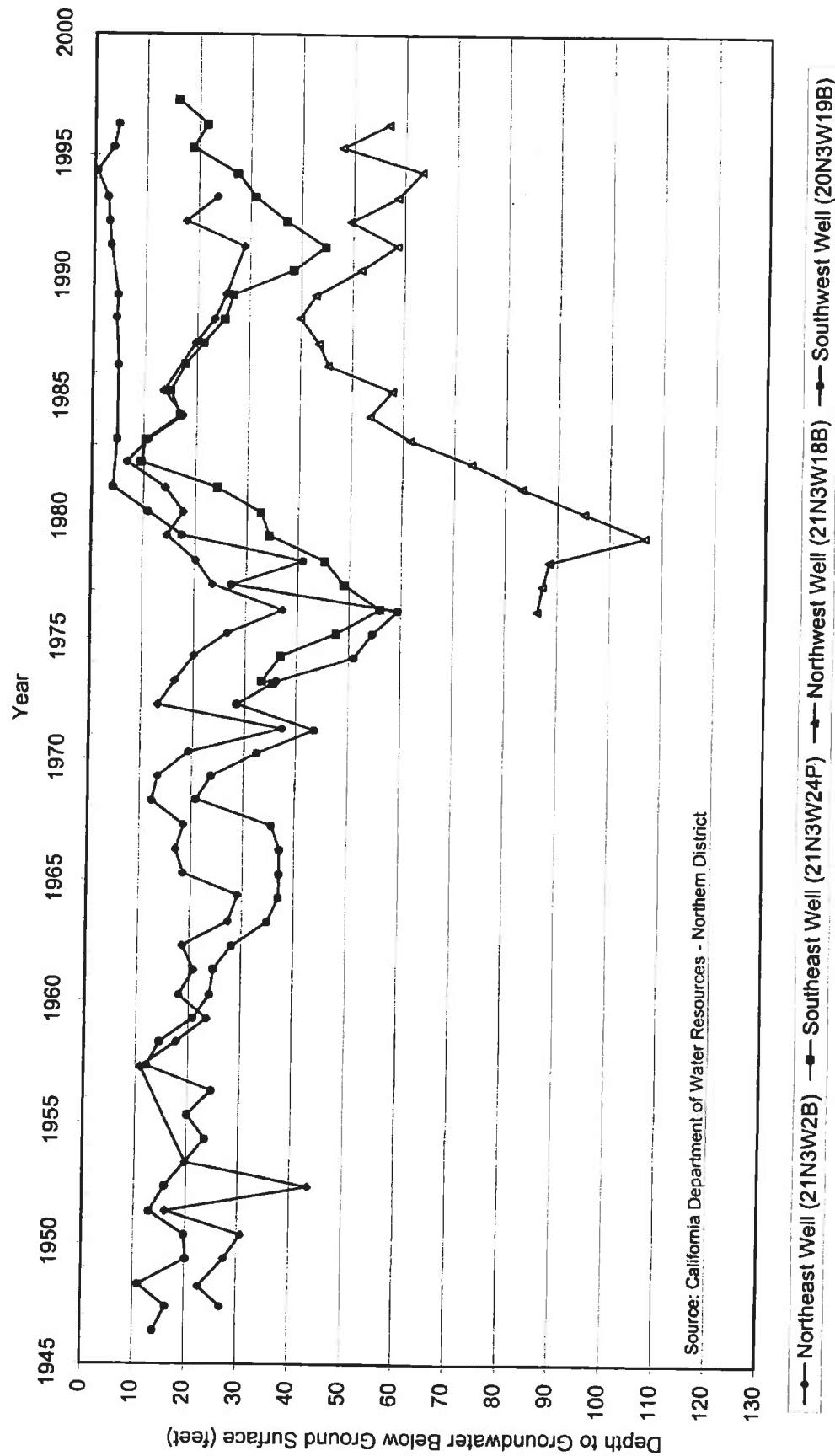


Figure 7
Orland-Artois Water District
Spring Depths to Groundwater in Selected Wells



V. GROUNDWATER MANAGEMENT PROGRAM

The elements comprising the District's Groundwater Management Program are described in the following sections.

A. Monitor Groundwater Levels and Quality

The District will initiate groundwater level and water quality monitoring activities to provide data that, in combination with other available sources of information, is adequate to track temporal and spatial trends in groundwater behavior. The wells to be monitored and frequency of observation will be determined by the District, with the input of DWR, consultants or others whom the District may engage for technical support. Historical groundwater elevation records published by DWR will be reviewed to identify those wells that should be included in the monitoring program, to preserve and extend available historical records, where possible. Additional wells may be identified and included in the program.

The District will cooperate with DWR and possibly other agencies to identify and implement monitoring protocols and procedures that are consistent with current accepted practice. This cooperation will include providing training to District staff in the use of identified procedures.

Initially, the District will rely on access to existing groundwater wells for monitoring purposes, but may elect to install additional wells or other facilities deemed necessary for carrying out an effective monitoring program. Access to existing wells will be gained through cooperation with District and possibly non-District landowners.

With respect to water quality monitoring, the District intends to deploy District staff to collect water samples from selected wells. Samples will be submitted to reputable commercial laboratories for analysis, following prescribed sampling and handling procedures. Water quality analyses will concentrate on the suitability of water for agricultural uses, but may be expanded to address other concerns that could arise.

The District will implement a simple, computer-based data management program to store, analyze and report groundwater data. Initially, this will be accomplished through the use of spreadsheet or database software programs already in use by the District.

B. Facilitate Conjunctive Use Operations

The District realizes that the reliability and sustainability of the water supply available to District landowners depends on the managed conjunctive use of available surface water and groundwater resources. In view of the possibility of future water supply shortages, the District intends to develop means to expand and enhance its conjunctive use operations. Activities that the District may pursue in this regard include: acquisition of additional surface water supplies to be used directly (thereby relaxing groundwater pumping) or for artificial recharge; acquisition of land and construction of groundwater recharge facilities; strategic pricing of surface water supplies to induce desired groundwater pumping patterns; and construction of groundwater extraction facilities. The District's principal role is to take actions to assure sufficient, affordable supplemental surface water supplies are available to

District water users. In particular, the District will protect and maintain its CVP water supply contract with the United States.

C. Implement Aquifer Storage and Recovery

The District has participated in studies that indicate that CVP water, above the District's CVP contract supply, may be available under certain hydrologic conditions, when CVP releases are surplus to those needed to maintain Delta water quality objectives. Additionally, CVP contract supplies available to T-C contractors (including OAWD and others), are not fully utilized in all years. These intermittent water supplies could be converted to firm, usable supplies if they could be stored and produced on demand.

The District has purchased a 20-acre site located immediately south of Stony Creek and adjacent to the T-C Canal for the purpose of underground storage and recovery of intermittent surface water supplies like, but not necessarily limited to, those described above. As part of this Program, the District intends to determine the feasibility of developing the site for this purpose. This will involve completion of operations analyses to provide initial estimates of the yield of an aquifer storage (recharge) and recovery system on the 20-acre site, based on certain assumptions regarding infiltration and recovery rates, as well as availability of water and conveyance capacity in the T-C Canal. If the system appears feasible, then the District may elect to proceed with physical on-site testing to validate the assumptions.

Based on the outcome of these investigations, the District may elect to develop the site for aquifer storage and recovery. The District may consider other sites, both within and outside of the District boundaries, for implementation of aquifer storage and recovery facilities. The District may pursue these facilities alone or in cooperation with other entities.

D. Construct Groundwater Management Facilities

As outlined above, the District intends to ensure reliable water supplies to its users, primarily through conjunctive use operations. Facilities that may be constructed to enhance conjunctive use include groundwater recharge basins, extraction wells and expanded surface water distribution systems.

E. Support County Wellhead Protection Program

Serious groundwater problems can result if wellhead areas are contaminated or if groundwater wells are not properly constructed and abandoned. In these situations, wells can become conduits for contaminants, pollutants, and degraded waters to flow into otherwise usable groundwater aquifers.

The Glenn County Countywide Service Area under its Wellhead Protection Program currently administers all matters pertaining to well construction and abandonment, wellhead protection and contamination. The District acknowledges the County's jurisdiction in this regard and will cooperate with the County through provision of any relevant, available information to which the District may have access.

F. Promote Water Conservation

The District recognizes that good management of available surface and groundwater supplies begins with water conservation, defined here as seeking to minimize the amount of water extracted to accomplish the intended beneficial use. Toward this objective, the District will continue to promote voluntary adoption of on-farm water management practices that are appropriate and cost effective under District conditions.

G. Cooperate with Glenn County Groundwater Management Efforts

Glenn County has adopted an ordinance governing the management of groundwater county-wide. The thrust of the County's efforts will be to establish safe yield of the County aquifers by the Basin Management Objective (BMO) method and then conduct monitoring to assure that the specified water level, water quality and land subsidence criteria comprising the safe yield are observed. The County has formed a Water Advisory Committee and the District has one chair on the Committee. As previously explained, the ordinance expresses the County's intent to cooperate with interested local agencies.

The District has taken an active role in development of Glenn County's Groundwater Management Ordinance and intends to support the County's efforts to implement the ordinance as an element of its own Groundwater Management Program. In particular, the District intends to cooperate with the County in establishing the safe yield of the aquifers underlying the District and in monitoring of groundwater conditions.

VI. PLAN IMPLEMENTATION

A. Rules and Regulations

According to Water Code Section 10753.8 (a), a local agency shall adopt rules and regulations to implement and enforce an adopted groundwater management plan. The local agency is not authorized to make a binding determination of the water rights of any person or entity (Section 10753.8 (b)). The local agency is also not authorized to limit or suspend extractions unless the local agency has determined through study and investigation that groundwater replenishment programs or other alternative sources of water supply have proved insufficient or infeasible to lessen the demand for groundwater (Section 10753.8 (c)).

In adopting rules and regulations, the local agency shall consider the potential impact of those rules and regulations on business activities, including agricultural operations, and to the extent practicable and consistent with the protection of the groundwater resources, minimize any adverse impacts on those business activities (Section 10753.9).

B. Program Management

This Groundwater Management Program will be implemented and managed according to the policy and guidance of the Board of Directors of Orland-Artois Water District. At least annually at one of its regular meetings, the Board will review available information pertaining to groundwater conditions and consider taking appropriate actions consistent with the Program.

C. Plan Revisions and Updates

This Groundwater Management Plan may be revised or updated from time to time, as deemed appropriate by the Board of Directors of the Orland-Artois Water District.

References

CALFED. Final Programmatic EIS/EIR July 2000.

Glenn County AB3030 Groundwater Management Plan.

Northern District, California Department of Water Resources. Sacramento River Basin-Wide Management Plan. Groundwater Hydrology Technical Memorandum.

State of California, Department of Water Resources. "Groundwater Basins in California, Bulletin 118-80." January 1980.

U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region. Technical working paper No. 2 Water Contracting Environmental Impact Statement.

U.S. Department of the Interior, Bureau of Reclamation. Water Needs Assessment, 2000.

Western Regional Climate Center, 2000.

ATTACHMENT “H”

GROUNDWATER BANKING PROGRAM

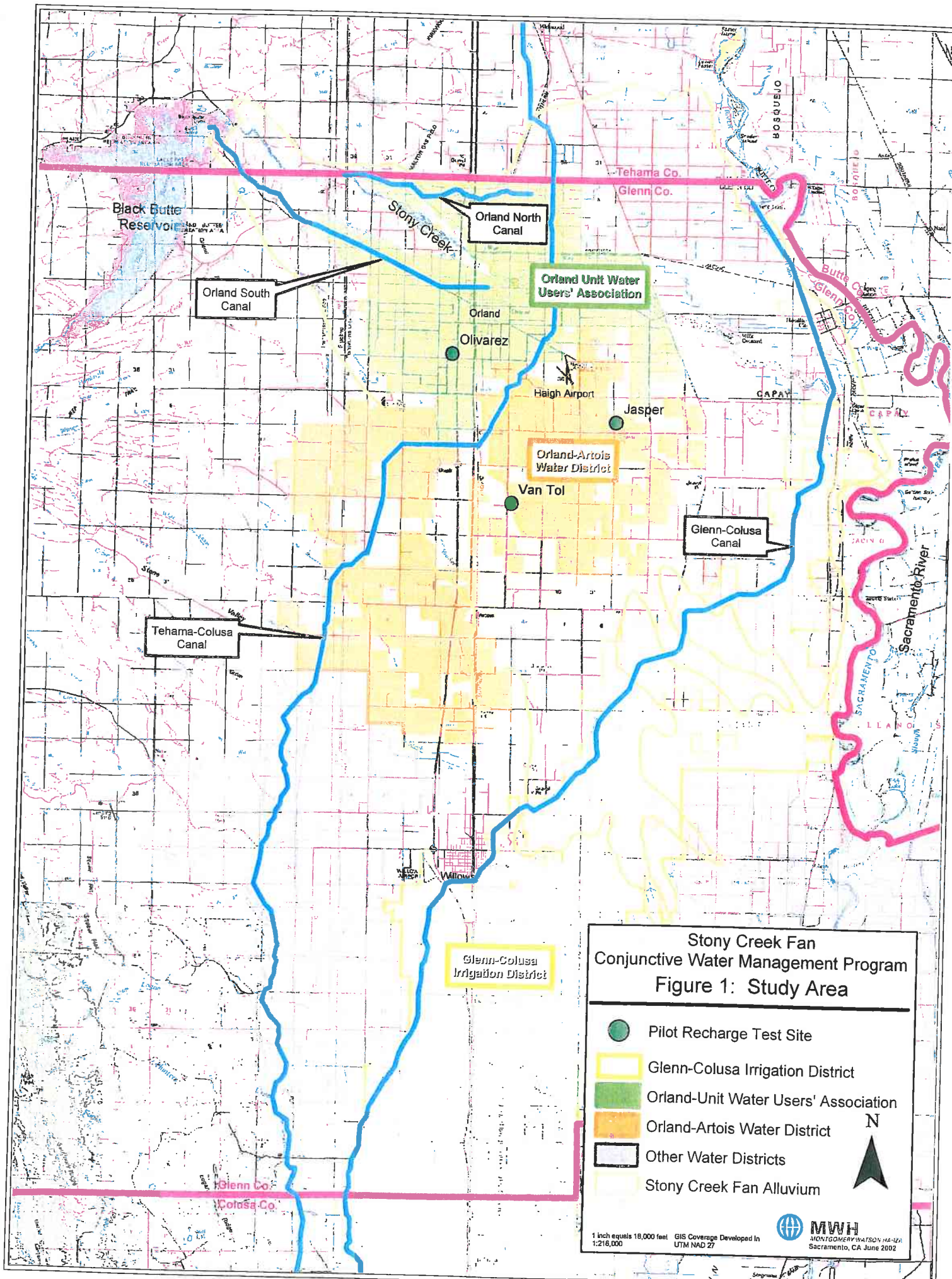


Table B-1
Summary of District Groundwater Pumping

District	Approximate Number of Groundwater Wells	Range of Historical Annual Groundwater Pumping (1000 AF/Yr)	Approximate In-lieu Capability (1000 AF/Yr)
GCID	200	4 to 17	17
OAWD	400	5 to 55	55
OUWUA	50	3 to 13	13
Total	650	12 to 85	85

The other method of artificial recharge represented on the flowchart is direct recharge. Following the direct recharge path of the flowchart the first question asks whether or not the recharge district has surplus surface supplies with which to recharge. If the answer is no direct recharge is not possible. A review of surface water supplies that could be used for direct recharge included unused Base Supply, unappropriated Stony Creek water and water available from re-operating East Park and Stony Gorge Reservoirs.

The next question to answer on the direct recharge path is whether favorable infiltration rates exist. If the answer were "No" then direct recharge would not be viable. For instance, soils consisting of fine sand to silty clay conditions are typically unsuitable for artificial recharge due to relatively low infiltration rates.

A field investigation of the Stony Creek Fan area was completed to determine infiltration characteristics within the Project Area and to help assess the feasibility of recharging the groundwater basin using constructed direct recharge basins. Candidate sites were identified throughout the area and were evaluated based on specific site selection criteria². Three sites were ultimately chosen for pilot recharge testing³. The three sites are considered to be representative of areas favorable for groundwater recharge throughout the Project Area.

The pilot recharge tests were conducted over a several week period under varied conditions. Infiltration rates varied from several feet per day to ten's of feet per day. The range of infiltration rates are summarized in **Table B-2**. These infiltration rates are considered highly favorable for direct recharge operations.

² The Pilot Recharge Test Site Selection Criteria are: soils and geologic conditions; groundwater conditions; land availability; water availability; site access; environmental issues; geographic variability. For a complete description refer to Stony Creek Pilot Test Site Selection Criteria Memorandum, MWH, October 2001.

³ See Technical Memorandum 2: Pilot Recharge Test Designs and Monitoring Program, MWH, August 2002

Table B-2
Pilot Recharge Test Infiltration Rates

Site	Long Term Infiltration Rate (ft/d)	
	Spreading Basin	Flooded Field
Van Tol	22	2
Jasper	45	6
Olivarez	10	0.5
1 Spreading basins are shallow ponds excavated to relatively shallow depths (2 to 6 feet) through low permeability soils and/or through shallow hardpan. 2 A flooded field refers to the groundwater recharge technique of applying shallow water to a bermed field (approximate berm height, 2 feet).		

With the finding that favorable infiltration rates exist in the Project Area, the next logical question along the "Direct Recharge" path is "Does recharge water reach the target aquifer?" If the answer is "yes" then proceed to the next step. If the answer is "No", then direct recharge may not be effective. The SCF investigation found that the recharge water, under the existing state of the basin, might not be reaching the target aquifer, the Tehama formation.⁴ Instead the recharge water appears to enter the Stony Creek Fan alluvium, where it may only reside in storage for a relatively short period - weeks or months as opposed to several months to several years - before being discharged from the area. It is postulated that the high conductivities associated with the alluvial materials result in lateral movement and lateral spreading of the recharge water, and little downward migration (see TM 3 for a detailed discussion of this finding). This finding is in stark contrast to the previously accepted theory that the Stony Creek Fan aquifer consisted of sand and gravel layers associated with the younger alluvial materials interbedded and interconnected with the silts and clays that are characteristic of the older alluvium, or Tehama formation.

The results of the field work described above suggests that in-lieu recharge may be a more effective than direct recharge in managing the long-term health of groundwater resources in the Project Area. Assuming the artificial recharge water reaches the target aquifer, the next question on the flowchart is "Does the recharge water appear to positively impact the storage of the basin?" In other words, does the recharge water improve basin conditions (e.g. groundwater elevations) or does the recharge water appear to run-off? If the answer to this question is "Yes" then artificial recharge appears viable. If the answer to the question is "No" then recharge water is being rejected possibly because the basin is already "full."

The term "full", as used here, is referring to groundwater conditions that are relatively stable, or in balance. Under these conditions water leaving the basin is approximately equal to water entering the basin on a long-term average annual basis. For instance, groundwater storage conditions in the Project Area have varied over the course of the last 30 years due to varied hydrologic and water supply conditions, however, the cumulative

⁴ The Tehama Formation typically includes confined (or semi-confined) water-bearing layers occurring at multiple depths, which are believed to be the source of groundwater pumped by most irrigation wells in the Study Area.

change in storage conditions has been minimal. This is supported by the following information:

- A water balance completed for the Project Area shows a net recharge on average of approximately 1.1 acre-feet per acre per year; and
- Review of groundwater level hydrographs throughout the region indicate groundwater levels typically return to pre-pumping conditions the following spring.

Based on the above findings, it was concluded that average annual natural recharge to the basin has generally exceeded average annual extractions from the basin, and artificial recharge at this time would not provide any additional direct benefit.

Assessment of Recovery

The recovery cycle, shown in **Figure B-4**, begins by asking "Transfer dry-year water?" If the answer to the question is no then the pumped groundwater would be used to meet local demand. Note that both legs of the flow chart could be followed and some water could be used to meet local demand while some could be reserved for transfer. If the answer to the transfer question is 'Yes' then a series of questions must be answered.

The first question is, does the groundwater pumping entity have access to dry year surface water supply to transfer. If there is no dry-year supply then a transfer is not possible. If the answer to the question is yes then the question is, "Is there conveyance for the transfer?" For example, both GCID and OAWD have relatively efficient conveyance for transfer water. Both districts would leave water in the Sacramento River. OUWUA is relatively more challenged for conveyance. The Stony Creek is believed to be a losing creek for much of the stretch between OUWUA and the Sacramento River.⁵ Therefore transfers down Stony Creek may be jeopardized by high losses. Potential transfers of OUWUA water may require involving exchanges with TC contractors.

If there is both dry-year surface water and conveyance ability the next question to answer is "is the transfer possible per the water code?" In general, groundwater substitution transfers have little trouble with a legal review. The legal 'transfer-ability' of source water available to the SCF partners, other than groundwater substitution water, is not as clear.

The components necessary to a groundwater substitution transfer are summarized in **Table B-3**. The three components are 1) dry year water supply 2) groundwater pumping capacity and 3) conveyance. The OAWD is limited in their dry-year surface supply but possess the other two attributes. The OUWUA has limited groundwater pumping capacity and potentially limited conveyance capacity but possess dry year surface water. GCID possesses all three components. In addition, field investigations have confirmed the presence of a potentially high-producing confined aquifer, the Lower Tuscan formation: Hydrogeologic investigations underway by DWR-Northern District have documented the presence of this formation in the vicinity of the Project Area. Evaluation of well logs

⁵ Personal conversations with Toccey Dudley of DWR.

supported by recently developed wells support the notion that this groundwater source could potentially provide new supplies to the Partners.⁶

Table B-3
Components of a Dry-year Groundwater Substitution Transfer

Partner	Groundwater Substitution Transfer Component		
	Dry Year Surface Supply	Groundwater Pumping Capacity	Conveyance of dry-year surface water
OAWD	Limited <i>(Junior CVP entitlement)</i>	Not limited	Not limited <i>(Forebear diversion into TC canal from Sacramento River)</i>
OUWUA	Not limited <i>(Adjudicated Pre-1914 storage and direct diversion rights)</i>	Limited	Limited <i>(Forebear diversions from Stony Creek – either travel down Stony Creek (high loss factor, or move water from South Canal to TC canal and ultimately Sac River at the drain).</i>
GCID	Not limited <i>(Base supply and supplemental CVP supply)</i>	Not Limited	Not limited <i>(Forebear diversions into the GCID from the Sacramento River)</i>

Summary of Physical Factors Influencing Alternatives Formulation

In summary, the field investigations and modeling analysis narrowed the set of alternative components. Initially the set of alternative components was believed to include variations of artificial direct recharge, in-lieu recharge, supply sources, extraction volumes, and yield destinations. However, as a result of the field investigations and subsequent modeling, artificial direct recharge was determined to offer less opportunity than originally thought. Furthermore, examination of historical water level data supported by modeling analysis indicates that the basin is more resilient than previously thought and is capable of supporting additional production. In addition, greater understanding of the hydrogeology has revealed new sources of potential groundwater supplies. These findings combined have lead too more focused alternative formulation focused on development of groundwater production through the SCF Partnership.

⁶ It is noted that development of the Lower Tuscan formation as a source of new supply poses risks not yet fully identified or understood. For example, there remains limited understanding of the potential range of well's yields, the potential physical effects of long-term pumping, and the potential political ramifications of landowners predisposed to using private landowner wells rather than district-owned wells. These unquantified risks will be addressed through future efforts to compare and analyze SCF project alternatives.

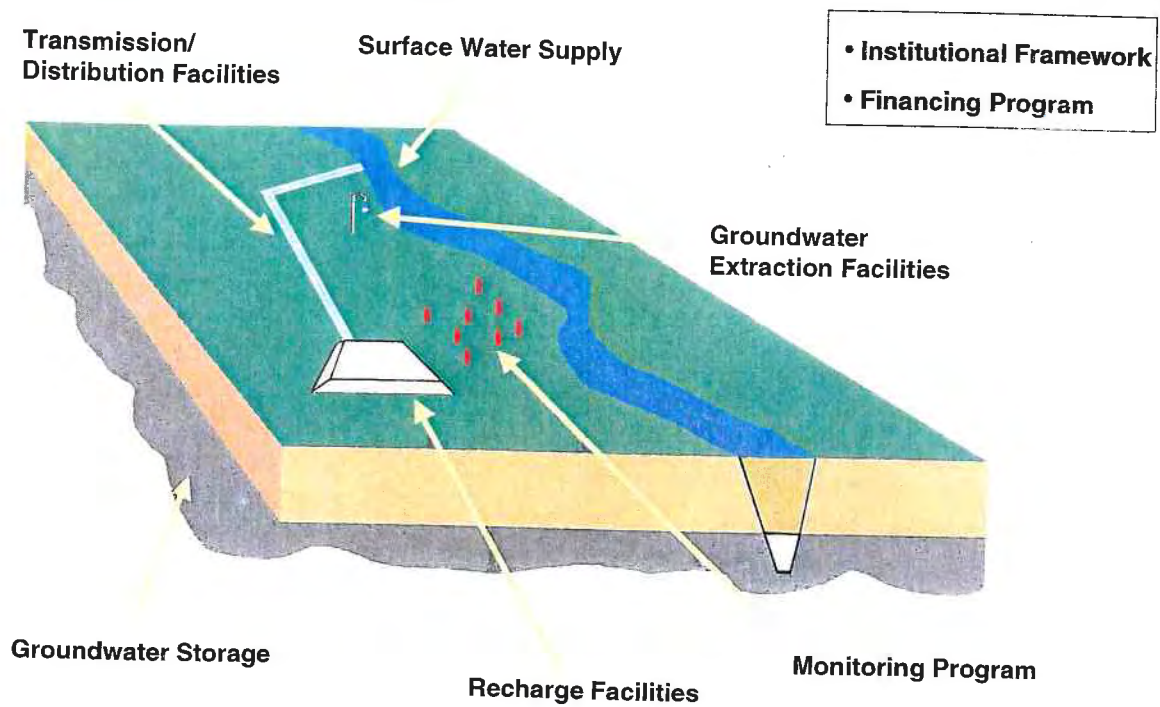


Figure B-1. Typical Components Required for a Conjunctive Use Program

Determine Feasibility of Artificial Recharge: If the basin assessment (described above) results in the need to artificially recharge the basin, the feasibility of various recharge options would be evaluated.

The Stony Creek Fan Feasibility Investigation analyzed how best to achieve conjunctive use in the Study Area. Water sources potentially available to the partners and an improved understanding of the groundwater basin was analyzed. This analysis process is described in the following paragraphs.

Figures B-3 and B-4 describe the particular questions that were answered to assess the SCF recharge and recovery, respectively. The following sections use these flowcharts to describe the process and findings associated with the Stony Creek Fan Feasibility Investigation.

Assessment of Artificial Recharge

Figure B-3 describes the steps that were followed to assess artificial recharge in the SCF Feasibility Investigation. Two primary paths were followed. One path evaluated in-lieu recharge and the other path evaluated direct recharge.

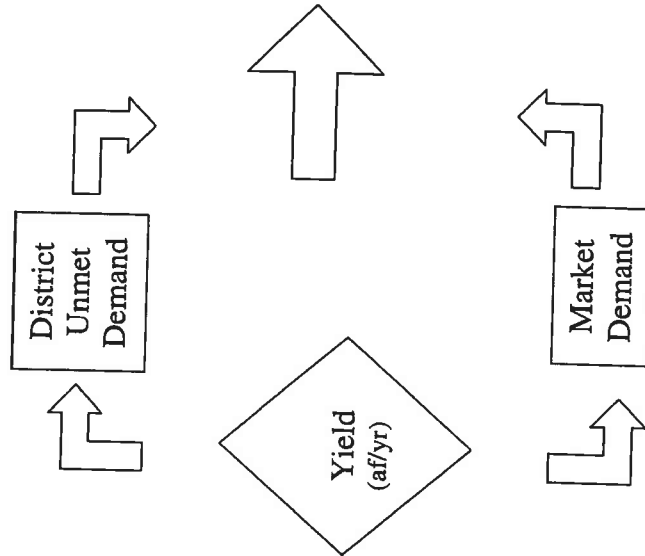
The in-lieu leg of the flowchart begins with the question "Does the recharge district have access to surplus surface water on an agricultural demand pattern?" If the answer is no, in-lieu recharge is not possible. A review of surface water supplies that could be used in-lieu of pumping groundwater revealed two possible sources: unused Base Supply; and unappropriated Stony Creek water.

The next question on the in-lieu path is "Does the recharge district have a history of groundwater pumping?" If the answer is no, in-lieu recharge is not possible because there is no pumping to stop in order to achieve the in-lieu recharge. If the answer to the question is yes, then an assessment of the volume of surface water available for use as a substitute during the in-lieu recharge period is required. Finally, the assessment of surface water would be combined with the estimates of historical pumping volumes in order to estimate the size of the in-lieu potential.

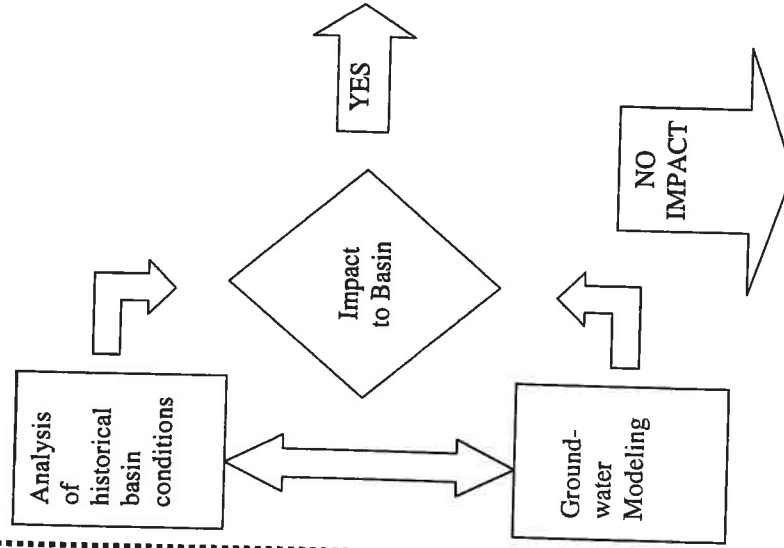
The SCF investigation initially estimated the historical volume of groundwater extracted by each district as an initial assessment of the feasibility of in-lieu recharge. **Table B-1** summarizes these findings. The results of this initial review suggested that in-lieu recharge may be possible given the amount of historical pumping.

"RECOVERY" CYCLE

Determine Yield Allocation

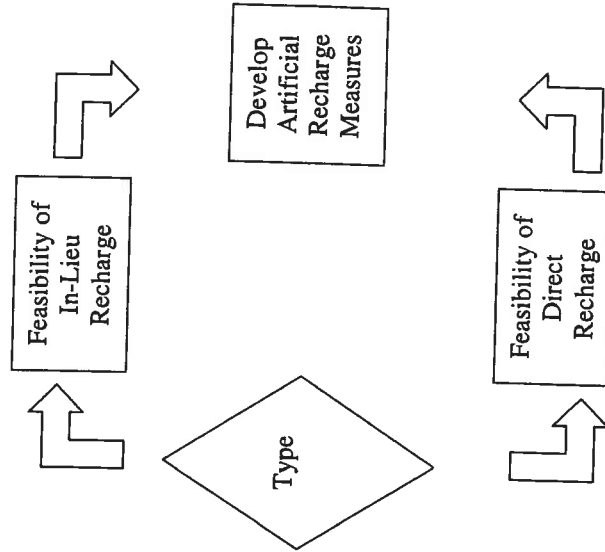


Assess Basin Response



"RECHARGE" CYCLE

Determine Feasibility of Artificial Recharge



Basin capable of supporting yield allocation

Operate "Recharge" and "Recovery" cycles according to basin and water year conditions, and consistent with institutional/legal requirements.

Monitor and assess conditions and make adjustments to program based on updated assessments.

Figure B-2. Formulation and Analysis of Conjunctive Use

ATTACHMENT “I”

DISTRICT AGRICULTURAL **ORDER/APPLICATION FORM**

ORLAND-ARTOIS WATER DISTRICT 2008 **APPLICATION FOR AGRICULTURAL WATER**

LANDOWNER _____ **PHONE # (Home)** _____
 Address _____ **(Office)** _____
 _____ **(Other)** _____

TENANT _____ **PHONE # (Home)** _____
 Address _____ **(Office)** _____
 _____ **(Other)** _____

Outlet #	Acres	Crop	Estimate of Water Requirements
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

The advance amount will be the same as it was for 2007: **\$30.30 X the Assessed acres. This will not be the water rate, which has been set at \$33.50 per AF.** Due to the uncertainty at this time of our allocation for 2008, the Board has decided to charge less on the amount required for your advance. **The advance amount and the water application are due on or before April 30, 2008, or prior to any water usage, whichever comes first. This includes water used for frost protection.**

_____ **Total Acres X \$30.30 =** _____ **Advance Amount**

The undersigned hereby jointly and severally apply to the ORLAND-ARTOIS WATER DISTRICT for agricultural water for irrigation of the above described lands. Water service to the above parcels of land is to be provided subject to the "Rules and Regulations for Agricultural Water Service" adopted by the Board on October 19, 2004. Receipt is hereby acknowledged of a copy of those Rules and Regulations and the same are incorporated herein as though set forth in full.

LANDOWNERS SIGNATURE _____

TENANTS SIGNATURE _____

Date _____ Amount Received _____ Check # _____

BOARD OF DIRECTORS

John Enos, President
Ernest Pieper, Vice President
Leigh McDaniel
Mike Vereschagin
Terry Devine

SECRETARY-MANAGER

Sue King

ORLAND-ARTOIS WATER DISTRICT

(A UNIT OF THE SACRAMENTO VALLEY CANALS)

P.O. BOX 218 • 6505 COUNTY ROAD 27

ORLAND, CALIFORNIA 95963

Telephone (530) 865-4304 • Fax (530) 865-8497

February 20, 2008

2008 WATER SUPPLY OUTLOOK

Dear District Landowner:

The Bureau of Reclamation announced their 2008 water supply outlook on January 25th. Their initial announcement was 25% of our contract supply. They are reviewing the snowpack data and will be coming out with a new announcement in the next few days. We anticipate that amount to increase, but there certainly aren't any assurances and there is some question as to whether or not we will reach our 100% allocation this year. To date Shasta Dam is still only about half full and it's down over a million acre feet from where it was at this time last year. We will keep you informed as soon as we get some updated information.

The board has set the 2008 water rate at \$33.50/AF. This is due in part to the uncertainty to our water supply and also the cost of conveyance through the Tehama-Colusa Canal. Our largest fixed cost is our share of the operating expenses of the Tehama Colusa Canal Authority. This year those costs are \$525,000 and we collect that amount through our water sales. The costs of running the canal are proportioned to the actual water use of each District, based on a 5 year rolling average. Orland-Artois Water District's share of the Canal expense equates to about 22% of their total expenses. This is a fixed cost to our District regardless of our water supply.

Because we are required to hold a public hearing on the water rate increase, the new rate will not go into effect until April. Any water used up to that point will be charged at last year's rate of \$30.30/AF. In addition, the board has decided to base your water advance amount on last year's rate. The new water year begins on March 1, 2008, so please make sure that you have all of the necessary applications, Reclamation forms, and your water advance into our office before you use water. The deadline for the form submittal is April 30th, *provided that you do not use water before that date. Please keep in mind that any water used for frost protection after February 29, 2008 needs to conform to the above mentioned form submittal and water advance requirements.* If you have any questions or need assistance, please contact the office.

Sincerely,



Sue King
Manager



Mobile Irrigation Lab

The Service:

- Provides an evaluation of your irrigation system and assists with managing irrigation water at **NO COST**.

Who's it for?

- Growers of any crop, pasture, or restoration project in Tehama, Glenn, Shasta, and Butte Counties.

What can it do?

- **Improve on-farm water management**
- **Increase water and energy savings**
- **Improve crop yields**
- **Increase profits**

Mobile Lab provides:

- A confidential report that includes: A soils map of your property & an analysis of the system's Distribution Uniformity (How evenly water is applied to the crop)
- Emitter/Sprinkler Flow Uniformity
- Amount of water applied during irrigation
- System map of pressure and flow measurements
- Suggestions for system improvements and maintenance
- Irrigation scheduling assistance

"My yields skyrocketed after making the changes the Mobile Irrigation Lab recommended!"
L. T. Corning, CA

To schedule an evaluation, or for more information, contact:
Lisa Miller at 530-527-3013 ext. 3, or lisa@tehamacountyrcd.org

* Tehama County RCD is a special district with no regulatory authority. Our work is entirely funded by grants and contracts.



**Tehama County
Resource Conservation District**
2 Switzer Street, Suite D
Red Bluff, CA 96080
(530) 527-3013 ext. 3



Sponsors/Cooperators: Bureau of Reclamation, Butte County RCD, Corning Water District, Department of Water Resources, Glenn County RCD, Natural Resource Conservation Service, University of California Cooperative Extension, Western Shasta RCD.



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Sponsors/Cooperators: Bureau of Reclamation, Butte County RCD, Corning Water District, Department of Water Resources, Glenn County RCD, Natural Resource Conservation Service, University of California Cooperative Extension, Western Shasta RCD.

Use During the Season to Aid Irrigation Operation

Due to variability of crop growth and weather, a fixed irrigation schedule (for example: irrigating every three days once irrigation begins) may not be effective.

A count of microsprinklers or drip emitters per acre is needed and a reliable estimate of the water emission rate per microsprinkler or dripper is needed to calculate the weekly hours of irrigation needed.

For Example: one microsprinkler is used per almond tree; each microsprinkler emits nine gallons of water per hour; and the orchard design has 151 trees per acre. So, the average hourly water application rate for this example is 1359 gallons per acre. This equates to a water application rate of 0.05 inches per hour of operation (1.0 acre-inch equals 27,154 gallons, refer to units section). Referring to the weekly water use for almond (west of river) from April 6 to April 12, 2007 was 0.95 inches.

Additional water is needed to compensate for non-uniform application of water. Field evaluations conducted by the Tehama County Irrigation Mobile Lab suggest 10 to 20 percent more water may be necessary. Table 2 suggests that 1.1 inches of water is needed to replenish the past week of crop water use, if irrigation efficiency is 90 percent. This equates to 22 hours of irrigation, not applied all at once, to replenish the past seven days of crop water use. Rainfall was low (0.14 inches) at the Gerber weather station indicating it was not a significant factor affecting irrigation for the week of April 6 to April 12.

Availability of Weekly Soil Moisture Loss Reports

The reports are available on a weekly basis from several sources from April through October:

Newspapers

Red Bluff Daily News – Saturdays

Coming Observer – Wednesdays

Websites

<http://www.nd.water.ca.gov/Data/IrrigationSchedule/IrrigationSchedule.pdf>

http://cehahama.ucdavis.edu/Agriculture/RealTime_Crop_ET.htm

E-Mail

Available via a weekly e-mail report on Fridays. Send e-mail request to aefulton@ucdavis.edu

← Open to Begin

For Additional Information or Assistance

Allan Fulton, UC Farm Advisor
527-3101 or aefulton@ucdavis.edu

Mark Rivera, Department of Water Resources
529-7301

Lisa Miller, TCRCD Irrigation Mobile Lab,
527-3013, ext. 3

a publication of



Tehama County Resource Conservation District
2 Sutter Street, Suite D
Red Bluff, CA 96080
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www.tehamacountyrcd.org
tcrcd@tehamacountyrcd.org

Design & photography
by

Bob Grace

bgrace@bobgrace.biz

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Resource Conservation District
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Understanding and Using Weekly Soil Moisture Loss Reports



WEEKLY SOIL MOISTURE LOSS IN INCHES
(Estimated Evapotranspiration)
04/06/07 through 04/12/07

West of Sacramento River

Weekly Water Use	Accum'd Seasonal Use	CROP (Leafout Date)	Weekly Water Use	Accum'd Seasonal Use
1.18	6.41	Pasture	1.19	6.36
1.13	6.35	Alfalfa	1.14	6.31
0.89	4.88	Olives	0.90	4.83
0.77	4.18	Citrus	0.77	4.13
0.95	4.18	Almonds (3/1) *	0.96	4.16
0.96	3.14	Prunes (3/15) *	0.97	3.07
0.64	1.04	Walnuts (4/1) *	0.64	1.03
1.24	5.29	Urban Turf Grass	1.25	5.24

East of Sacramento River

Weekly Water Use	Accum'd Seasonal Use	CROP (Leafout Date)	Weekly Water Use	Accum'd Seasonal Use
1.18	6.41	Pasture	1.19	6.36
1.13	6.35	Alfalfa	1.14	6.31
0.89	4.88	Olives	0.90	4.83
0.77	4.18	Citrus	0.77	4.13
0.95	4.18	Almonds (3/1) *	0.96	4.16
0.96	3.14	Prunes (3/15) *	0.97	3.07
0.64	1.04	Walnuts (4/1) *	0.64	1.03
1.24	5.29	Urban Turf Grass	1.25	5.24

Accumulations started on February 23, 2007. Criteria for beginning this report are based on the season's last significant rainfall event where the soil moisture profile is at full capacity.
* Estimates are for orchard floor conditions where vegetation is managed by some combination of strip applications of herbicides, frequent mowing or tillage, and by mid and late season water stress. Weekly estimates of soil moisture loss can be as much as 25 percent higher in orchards where cover crops are planted and managed for maximum growth.

0.14	Precipitation (Inches)	0.33
0.68	Accum'd Precip (Inches)	1.04

WEEKLY APPLIED WATER IN INCHES¹

50%	60%	70%	80%	90%	← Efficiency →	50%	60%	70%	80%	90%
1.8	1.5	1.3	1.1	1.0	Olives	1.8	1.5	1.3	1.1	1.0
1.5	1.3	1.1	1.0	0.9	Citrus	1.5	1.3	1.1	1.0	0.9
1.9	1.6	1.4	1.2	1.1	Almonds (3/1)	1.9	1.6	1.4	1.2	1.1
1.9	1.6	1.4	1.2	1.1	Prunes (3/15)	1.9	1.6	1.4	1.2	1.1
1.3	1.1	0.9	0.8	0.7	Walnuts (4/1)	1.3	1.1	0.9	0.8	0.7

¹The amount of water required by a specific irrigation system to satisfy evapotranspiration. Typical ranges in irrigation system efficiency are: Drip Irrigation, 80%-95%; Micro-sprinkler, 80%-90%; Sprinkler, 70%-85%; and Border-furrow, 50%-75%.

For further information, contact the Tehama Co. Farm Advisor's office at 527-3101.

Weekly Soil Moisture Loss Reports are provided by the Northern District of the California Department of Water Resources and the University of California Cooperative Extension in Red Bluff.

These reports are available on a weekly basis from April through October. Estimates for "West of the Sacramento River" are more representative of Tehama County because they are based on CIMIS data taken near Gerber Avenue and Hwy 99W. The "East of the Sacramento River" estimates are based on CIMIS data from Durham.

Weekly Soil Moisture Loss in Inches (First Table)

- estimates soil evaporation and plant consumption for major irrigated crops
- gives crop water use for past seven days and accumulated seasonal use
- is based upon hourly measurements of sunlight, relative humidity, wind, and rainfall
- is intended for healthy crops where soil moisture is not limiting crop growth
- is intended for bearing orchards (typically fifth leaf or older)
- will overestimate irrigation needs for unhealthy trees, young trees, or where water stress may be beneficial
- suggests a maximum amount of irrigation water needed and should be confirmed in the field
- is based on accumulation start dates which change with each irrigation season

Weekly Applied Water in Inches (Second Table)

- estimates the amount of water required by various irrigation systems
- provides efficiency ranges for various irrigation systems

Reporting Units and Useful Conversion Factors

- actual reporting units in both tables are acre-inches per acre. To simplify, the acre units are canceled out and only inches are reported.
- reporting unit "inches" are the same as commonly used to report rainfall
- soil moisture loss reported in inches can be easily converted to feet (acre-feet per acre) by dividing by 12
- one inch (acre-inch per acre) of water equals 27,154 gallons
- one foot (acre-foot per acre) equals 325,851 gallons

To Help Decide When to Begin the Irrigation Season

Refer to the first table and select the crop in question. Compare the "Accumulated Seasonal Use" to the "Accumulated Rainfall." When the accumulated rainfall begins to drop below the accumulated seasonal use, the shortfall should be provided by irrigation.

For Example: Accumulated seasonal use for almonds west of the Sacramento River from March 1 through April 12, 2007 was 4.18 inches. Accumulated rainfall for the same period was 0.68 inches, indicating a soil moisture deficit of 3.50 inches that should be supplied with irrigation. Rainfall measurements taken from your own ranch will improve the accuracy of these projections.

ATTACHMENT “J”

CONJUNCTIVE USE PROGRAM

EXHIBIT "A"
STONY CREEK FAN
CONJUNCTIVE WATER MANAGEMENT PROGRAM
SCOPE OF WORK

Task 1 – Program Outreach

The Stony Creek Fan Partners (Partners), Glenn-Colusa Irrigation District (GCID), Orland-Artois Water District (OAWD), and the Orland Unit Water Users Association (OUWUA) are undertaking construction of deep production wells in an adaptive management mode, with the decisions of whether and where to construct wells being based on the results of well logs, aquifer test results and information. The Partners intend to engage interested entities and individuals in a process of information sharing in this regard. Interested parties include: the Counties of Butte, Colusa, Glenn and Tehama; landowners overlying the deeper aquifer, both within and outside of local water districts; and other interested parties. The activities envisioned under this task include presentations to county water and other officials as appropriate, participation in public meetings, and general public outreach. The specific actions to be undertaken will be identified during the course of work, both on a proactive and reactive basis, depending on the needs and interests that arise. The proactive outreach elements will include informing the public about plans to drill test holes and production wells before those activities are undertaken.

Deliverables: A Program Outreach Plan (Plan) identifying the activities to be conducted will be developed and submitted for review. The Plan should identify how outreach activities to be implemented under this contract will be coordinated with and integrated into outreach programs proposed for other Sacramento Valley planning efforts.

At the conclusion of the project, a record will be prepared of the various outreach activities conducted, including the date on which the outreach activity was conducted, the nature of the event and those in attendance.

Task 2 –Exploratory Drilling

Task 2A - Test Hole Siting Analysis

Review logs of existing test hole and production wells that penetrate the Lower Tuscan within GCID and adjoining areas, including OAWD, Maxwell Irrigation District and the OUWUA. Select a minimum of five general test well locations within GCID. Coordinate with landowners to identify willing cooperators in the selected locations and complete right-of-entry agreements to provide access. These agreements will address public notification procedures, notification of the Underground Service Alert forty-eight (48) hours before the start of drilling operations, site access and traffic controls for construction and monitoring, and responsibility for maintenance of monitoring facilities. Prior to construction, complete the appropriate level of environmental review, which is anticipated to be a categorical exemption or an Initial Study and Negative Declaration (IS/ND).

Deliverable: Map of the selected test well sites with a brief accompanying memorandum summarizing the work completed.

Task 2B – Test Hole Drilling and Abandonment

Six test holes will be constructed by a California State Licensed Well Driller. Construction activities are expected to include:

- Drill rig mobilization/demobilization
- Borehole drilling: 6-inch diameter, 1,300 feet depth
- Geophysical logging of each borehole: samples will be collected at 15 to 20 foot intervals, or as determined otherwise onsite based on the cuttings, for visual inspection. A suite of geophysical logs will be run including normal and short resistivity, gamma, spontaneous potential logs and caliper logs.
- Disposal of cuttings: it is assumed that cuttings will be disposed of on-site.
- Abandonment to eliminate the boreholes as possible means for the preferential migration of poor-quality water, pollutants, and contaminants; and, to prevent a possible hazard to humans and animals. Exploratory borings shall be completely filled with appropriate sealing material from bottom to top, if located in areas of known or suspected contamination or pollution. Borings located outside such areas shall, at a minimum, be filled with sealing material from ground surface to the minimum depths specified in Section 23 of the Water Well standards. Additional sealing material shall be placed below the minimum surface seal where needed to prevent the interchange if poor-quality water, pollutants, or contaminants between strata penetrated by the boring.

Deliverable: Reports of the geophysical logging conducted at each of the five sites.

Task 3 – Groundwater Production Element

Task 3A - Private Production Well Inventory

One of the original ideas identified for producing additional groundwater for conjunctive management was to enroll selected private wells into sponsored groundwater production programs. The additional groundwater production could be used to fill dry year shortages (to the extent that the wells would not otherwise be used), facilitate groundwater substitution based water transfers or to mitigate the risk of shortages caused by reservoir re-operation. Under this task, a preliminary list of wells that exist in the Orland Project service area will be developed based on the combined knowledge of OUWUA field staff. A letter will be mailed to all OUWUA landowners of record, asking them whether they own groundwater wells and, if they do, requesting basic information about the well(s) and soliciting their general interest in enrolling their well(s) in an OUWUA-managed program. One-on-one interviews would then be conducted with selected potential participants to learn more about historical well operation and to discuss possible terms that would attract them voluntarily into participation while providing the desired level of control over the well by the OUWUA.

Deliverables: A database of existing groundwater well locations and attributes, supported by a technical memorandum. The memorandum will describe the inventory process, define the attributes and summarize the results of the grower survey.

Task 3B – Production Well Design Assistance

The Partners expect to rely substantially on technical advice provided from DWR's Northern District in the interpretation of test hole logs and design of production wells based thereon. In addition, the Partners intend to engage the services of a qualified hydrogeologic consultant and a civil engineer to assist in this process. The work performed by these individuals will address two primary factors: determination of where to construct new wells and specification of well features. Consideration of where to construct additional wells will be based on hydrogeologic considerations, such as aquifer characteristics and potential well interference, and operational considerations, such as well production relative to water demands.

Activities performed under this task will include assembly and interpretation of available well logs, aquifer tests and other information, attendance at meetings with DWR and the Partners, development of well siting and design specifications, conduct of operations analyses, and documentation of work performed.

Deliverable: Task will be one (or possibly more) technical memorandums documented the work performed and the conclusions reached.

Task 3C – Environmental Documentation

The Partners will prepare any necessary environmental documentation to address their individual and combined actions related to development of the Lower Tuscan Formation. Under this task, it is anticipated that the actions may be, at least initially, subject to a categorical exemption under CEQA Guidelines section 15306, after which an IS/ND may be prepared to address the further actions of the Partners.

Deliverable: Appropriate level of environmental documentation.

Task 3D – Production Well Construction

Five production wells will be constructed by a California State Licensed Well Driller. The location of the wells will be based on the growing, but still rather limited body of knowledge concerning the Lower Tuscan, as discussed under Task 4A. It is expected that at least one well will be constructed within the boundaries of each Partner's jurisdiction. Based on experience gathered from the few production wells and test holes that have been drilled into the Lower Tuscan in Glenn County, it is assumed that the typical production well will have a 30-inch bore hole diameter to a depth of 1,330 feet, 1,030 feet of 18-inch steel casing, 290 feet of screened casing and design capacity of 3,000 gpm. The actual features and capacity of each well will depend on the e-logs and other information derived from the test holes.

Note: DWR grant funds will be augmented by secured federal funds to enable execution of this task. (See Table 1.)

Deliverable: Five production wells drawing primarily from the Lower Tuscan Formation.

Task 4– Engineering & Legal Services

Specifically in relation to the OUWUA, the production wells to be constructed could eventually be operated, among other purposes, for mitigating water supply shortages that result from re-operation of Orland Unit storage reservoirs. The OUWUA has made certain progress toward conducting water transfers based on reservoir re-operation working in cooperation with the U.S. Department of Interior (U.S.). The U.S. has agreed in principle that water can be transferred from the Orland Unit based on re-operation of Orland Unit reservoirs on Stony Creek (East Park and Stony Gorge); however, the U.S. has asserted that there are limitations on the use/crediting of water transfer revenues, and these limitations would constrain the ability of the Orland Unit to implement its conjunctive water management program. Under this task, professional engineering and legal services would be provided to assist the OUWUA in achieving broader latitude in using water transfer revenues. This broader latitude is needed so that the OUWUA can direct water transfer revenues into implementation of the Stony Creek Fan Conjunctive Water Management Program.

Deliverable: Notes from meetings held in this regard.

Task 5 – Program Management

The Partners intend to engage the services of a subcontractor to provide overall program management and coordination of the work conducted under the contract. This will include, but not necessarily be limited, to the following functions:

- Coordination among the Partners
- Facilitation of meetings among the Partners and with other entities
- Financial tracking and management
- Coordination among technical specialists engaged to provide professional services

- Program administration and management
- Preparation of contractually required reporting

Deliverable: Contractually required reports.

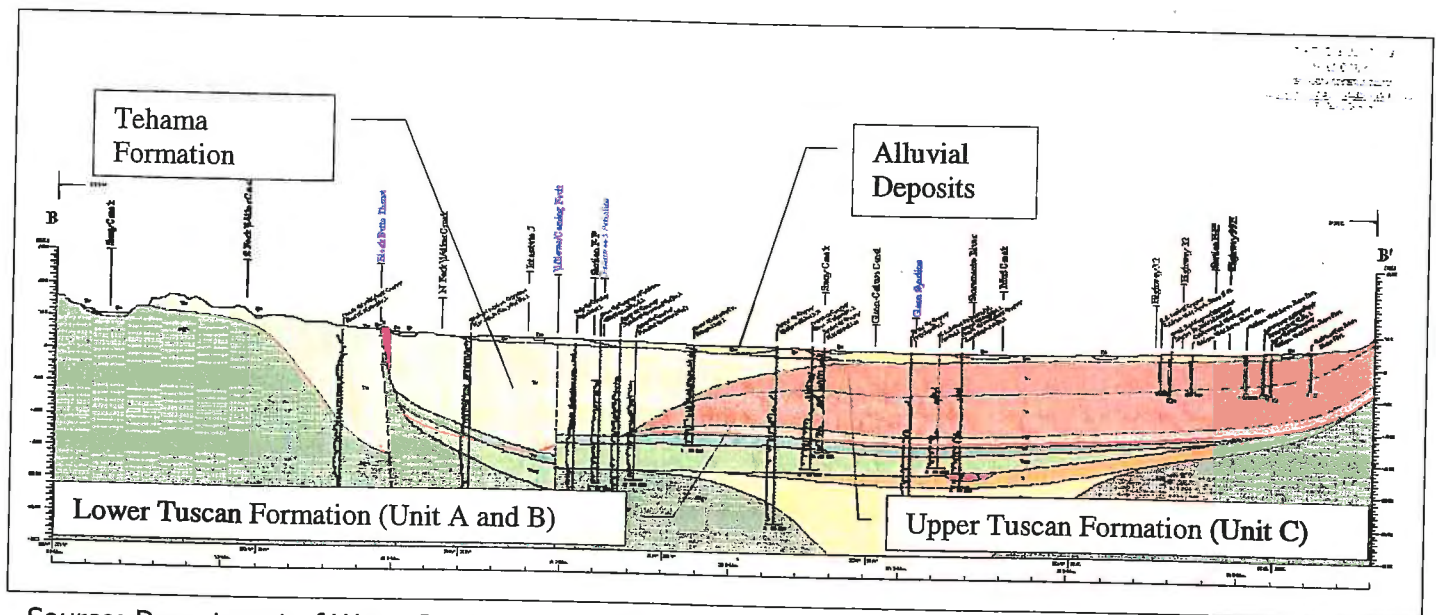
Budget

The estimated budget for each of the tasks identified in the Scope of Work is presented in Table 1. Task 3 involves construction of production wells that would be funded in part by federal appropriations that will be administered by the Mid-Pacific Region of the Bureau of Reclamation. If for any reason the federal funds are not provided, then three production wells, not five, would be constructed under Task 3.

Detailed buildups of costs for test holes and production wells are presented in Tables 2 and 3 respectively. Cost buildups for professional services are presented in Table 4.

Schedule

The work identified above will be completed between September 2006 and May 2008.



Source: Department of Water Resources (Draft)

Figure 5. Geology of the Stony Creek Fan Area, Glenn County, California

Tehama Formation

The upper alluvial deposits are a relatively thin veneer sitting on top of the thicker Tehama formation. The Tehama formation is different in the northern and southern portions of the Colusa Subbasin (DWR, 2003a). In the northern subbasin, generally coinciding with the Project Area, the formation consists of moderately compacted silt, clay, and fine silty sand enclosing lenses of sand and gravel, silt and gravel, and cemented conglomerate (DWR, 2003c). Occasional deposits of interbedded gravel from the ancestral Stony Creek constitute productive water-bearing zones. Thick clays of the upper Tehama formation underlie the water-bearing zone of the upper alluvium. The less pervious nature of this upper clay area suggests significant impediment to vertical downward movement of recharge water from the relatively pervious (transmissive) upper alluvium. However, as noted previously, the degree of connectivity between the formations has not been established.

The Tehama formation ranges in thickness in the Project Area from about 200 feet to several hundred feet. In contrast to the upper alluvium, the Tehama formation is generally not very transmissive and behaves as a semi-confined aquifer system. The degree of confinement generally increases with depth. The Tehama formation is the primary zone from which agricultural wells in the Project Area produce groundwater.

Tuscan Formation

The Tuscan formation enters the Sacramento Valley along the eastern margin of the Sacramento Valley. It extends approximately 15 miles westward of the Sacramento River as it dips beneath the Colusa Subbasin and interfingers with the Tehama formation. It is estimated to be present in the Project Area at depths ranging from 300 to 1000 feet based on preliminary data from ongoing DWR investigations (DWR, 2003a).

FACTORS INFLUENCING CONJUNCTIVE WATER MANAGEMENT

Discussion of Physical Factors Influencing Alternatives Formulation

The basic components of a conjunctive use system are (see **Figure B-1**):

- A groundwater aquifer and extraction facilities
- Recharge
- Surface water and distribution facilities

The Stony Creek Fan area appeared well suited for development of a conjunctive use system given the following characteristics¹:

- A large groundwater aquifer and extraction facilities well positioned to support groundwater production and in-lieu recharge operations;
- The presence of the Stony Creek Fan, formerly thought of as the primary subsurface geologic feature beneath the Project Area, thought to have extensive groundwater storage and yield properties as well as highly permeable and transmissive properties capable of accepting natural and artificial recharge at relatively rapid rates;
- Viable surface water supply sources for storage and replenishment of groundwater through direct and/or in-lieu artificial recharge; and

The strategic institutional alliance formed between GCID, OAWD, and OUWUA, planned to explore bringing these components together to develop a successful, sustainable regional conjunctive use program.

Conceptual Development of a Conjunctive Use Program

Conjunctive use is achieved through three components, 1) recharge of water, 2) recovery of the recharged water and 3) assessment of monitoring needs. The physical and political sustainability of a regional conjunctive user program can be assured via this third component, by assessing the need for monitoring the impact on the basin. These three components are discussed below in more detail and represented in **Figure B-2**.

Determine Yield Allocation (Recovery): Project configurations are defined principally by the magnitude and allocation of Project yield, which shape the Project's extraction or recovery cycles. Basic options include allocation to satisfy district unmet water demands, or to meet market demand. These options help define the primary features that drive the formulation of the project alternatives.

Assess Basin Response: Characterizing the factors that influence groundwater behavior within the project area. Determining how maintain healthy groundwater conditions in order to maximize potential project yield and thereby increase the efficacy with which resources are used.

¹ It was recognized that the geology of the Stony Creek Fan was not well known, and a major objective of the feasibility investigation would be to characterize the factors that influence groundwater management in SCF Study Area. The outcome of these investigations changed the above thinking considerably, which is discussed further below.

Attachment C:

Orland-Artois Water District's water is measured by the Tehama-Colusa Canal Authority at the Canal Diversions to the District system by meters. The District measure's Water to be billed at 304 metered deliveries monthly.

Attachment D:

OAWD's meters show flow in Cubic Feet per Second and totalize in Acre-Feet. Customers are bill in Acre-Feet.

Attachment E:

OAWD's staff compares the amounts of water measured at the District's metered delivery's to the water measured at the TCCA diversions monthly. The difference on a yearly basis has not exceeded 4%.